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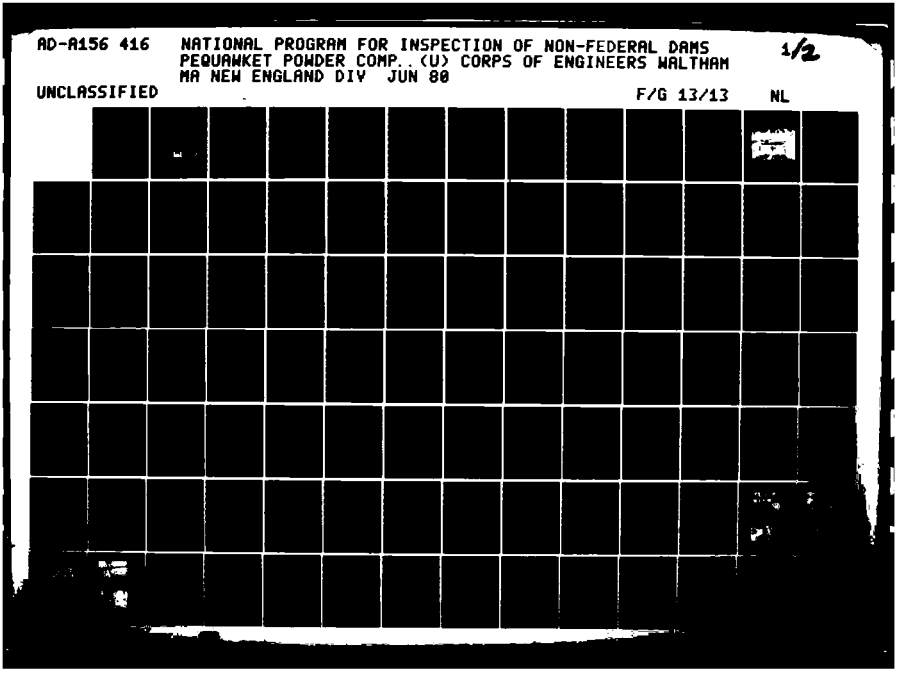

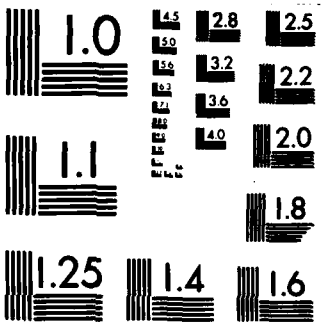

SACO RIVER BASIN

CONWAY, NEW HAMPSHIRE

PEQUAWKET POWER COMPANY DAM

NH 00322

NHWRB NO. 52.02

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JUNE 1980

UNCLASSIFIED

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Saco River Basin
Conway, New Hampshire
Pequawket

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is a concrete stop log spillway structure located between earthen abutments. It is 45 ft. long with a maximum height of 15.5 ft. There are no gates or other operating facilities incorporated into this dam. It is considered to be in fair condition. The dam is intermediate in size with a significant hazard potential. The test flood ranges from ½ PMF to the PMF. There are various remedial measures which should be implemented by the owner.

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PEQUAWKET POWER COMPANY DAM
NH 00322
NHWRB 52.02

SACO RIVER BASIN
CONWAY, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I - INSPECTION REPORT
BRIEF ASSESSMENT

Identification No: NH 00322

Name of Dam: Pequawket Power Company Dam

Town: Conway

County and State: Carroll, New Hampshire

Stream: Pequawket Brook

Date of Inspection: June 9, 1980

The Pequawket Power Company Dam is a concrete stoplog-spillway structure located between earthen abutments. The dam is approximately 15.5 feet high from the channel bottom at the toe of the dam to the top of the training walls with an overall length of nearly 45 feet. The spillway measures about 36.8 feet between concrete training walls with a 2 feet thick concrete pier located in the center providing two openings, each about 17.4 feet long. These openings are each divided into three stoplog bays by vertical 12-inch wide I-beams which hold the stoplogs in place. These four vertical stanchion beams are each held in place by a pin at the top attaching them to the concrete service bridge. Removal of these pins would allow the stanchion beams to pivot and fall into the downstream channel, thereby providing a greater cross-sectional area available for discharge. There are no gates or other operating facilities incorporated into this dam.

The dam impounds water from Pequawket Brook and Page Randall Brook. The spillway discharge flows in a northerly direction about 0.5 miles to its confluence with the Swift River. The dam was originally constructed to generate electricity for adjoining mills, but was rebuilt to serve recreational purposes. The pond is 1.29 miles in length with a surface area of about 143 acres. The maximum storage capacity at top of dam is about 1,880 acre-feet.

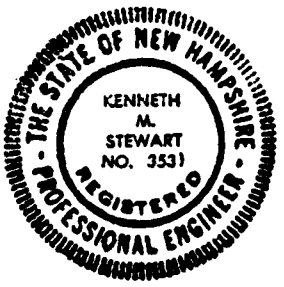
As a result of the visual inspection of this facility, the dam is considered to be in FAIR condition. Major concerns are: minor seepage through the split stone wall located behind the left training wall; a longitudinal crack in the left span of the concrete service bridge; erosion of both concrete training walls at the downstream toe of the dam; and the general lack of surface erosion protection on both abutments.

This dam is classified as INTERMEDIATE in size and a SIGNIFICANT hazard structure in accordance with the recommended guidelines established by the Corps of Engineers. The test flood for this dam, therefore, ranges from one-half the

Probable Maximum Flood (1/2 PMF) to the Probable Maximum Flood (PMF). Since the dam falls on the lower end of the intermediate size range, the 1/2 PMF was utilized for this hydrologic analysis. The test flood inflow was estimated to be 18,400 cfs and resulted in a routed test flood outflow equal to 14,100 cfs which would overtop the dam crest by about 4.3 feet. The maximum spillway capacity with the water level at the dam crest and the "typical" arrangement of stoplogs (eight per bay) in place was estimated to be 1,780 cfs, or about 13 percent of the routed test flood outflow. An assumed breach with the water surface at the dam crest would cause an increase of about 1 foot in the downstream prefailure tailwater, bringing the water surface to a point approaching the sill of the restaurant supply business located near the right abutment of the dam. The potential for economic loss would exist.

It is recommended that the owner engage a qualified registered engineer to investigate the seepage through the split stone wall located behind the left training wall; investigate the longitudinal crack in the left span of the concrete service bridge; investigate the erosion of the concrete training walls at the toe of the dam; specify erosion protection for the soil abutments at both ends of the dam; and perform a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam and the need for and the means to increase project discharge.

The recommendations and remedial measures are described in Section 7 and should be addressed by the owner within one year after receipt of this Phase I Inspection Report.



Kenneth M. Stewart
Project Manager
N.H.P.E. 3531

S E A Consultants Inc.
Rochester, New Hampshire

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and

rarity of such a storm event, finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespassing and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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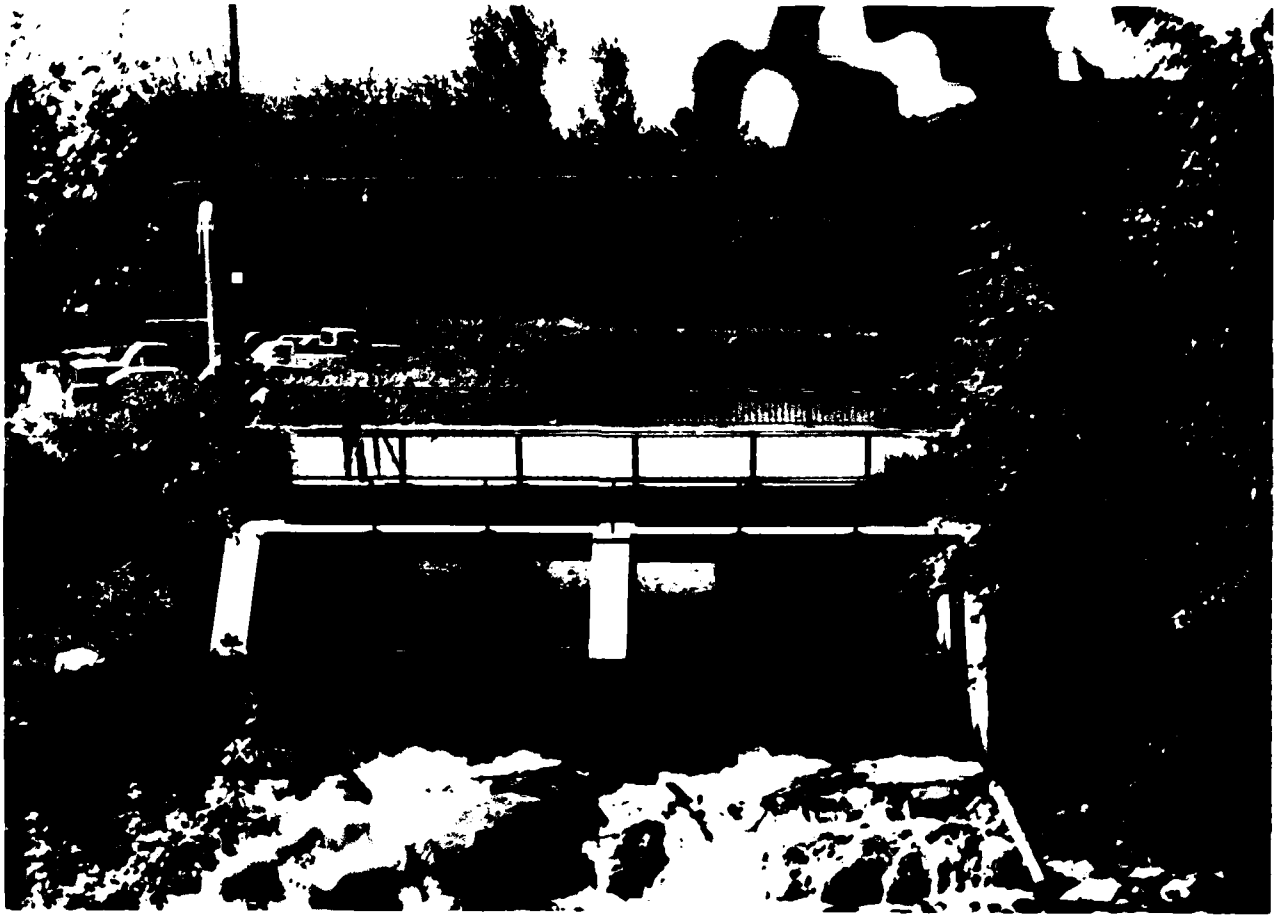
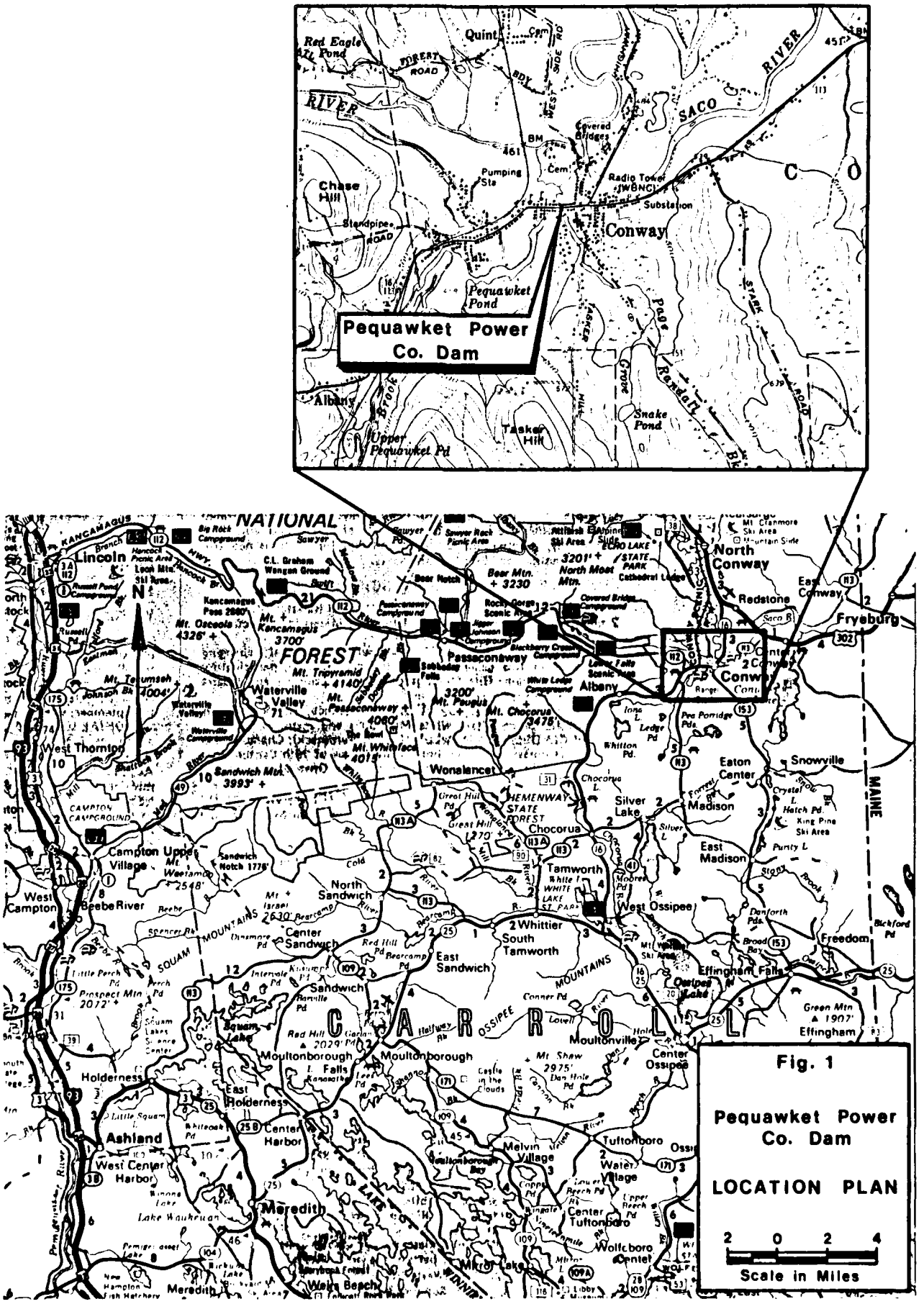


OVERVIEW PHOTO - PEQUAWKET POWER COMPANY DAM


Pequawket Power Co. Dam
Red Eagle Pd
Quint
Cem
Forest Road
Saco River
Chase Hill
Standpipe
Road
Pumping Sta
Covered Bridges
Radio Tower (WBNC)
Substation
Conway
Pequawket Pond
Albany
Upper Pequawket Pd
Tasker Hill
Snake Pond
Stark
Randall
Bk
Road
Fig. 1
Pequawket Power Co. Dam
LOCATION PLAN
2 0 2 4
Scale in Miles

X

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
PEQUAWKET POWER COMPANY DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. S E A Consultants Inc. has been retained by the New England Division to inspect and report on selected dams in the state of New Hampshire. Authorization and notice to proceed were issued to S E A Consultants Inc. under a letter of November 5, 1979 from William Hodgson Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C0008 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests

(2) To encourage and prepare the states to initiate quickly effective dam safety programs for non-federal dams

(3) To update, verify and complete the National Inventory of Dams

1.2 Description of Project

a. Location. The Pequawket Power Company Dam is located in the town of Conway, New Hampshire at the north end of Pequawket Pond, immediately downstream of the NH Route 16 bridge (Main Street Bridge) in Conway, New Hampshire. The dam impounds water from Pequawket Brook and Page Randall Brook. The spillway discharge flows in a northerly direction approximately 0.5 miles to its confluence with the Swift River. The dam is shown on U.S.G.S. Quadrangle, Ossipee Lake, New Hampshire, with coordinates approximately at N43°58'43", W70°07'16", Carroll County, New Hampshire (See Location Plan).

b. Description of Dam and Appurtenances. Pequawket Power Company Dam is a concrete stoplog-spillway structure located between earthen abutments and is primarily an extension of a highway culvert. The dam is approximately 15.5 feet high from the channel bottom at the toe of the dam to the top of the training walls with an overall length of nearly 45 feet. The spillway measures about 36.8 feet between concrete training walls with a 2 feet thick concrete pier located in the center providing two openings, each about 17.4 feet long. These openings are

each divided into three stoplog bays by vertical 12-inch wide I-beams which hold the stoplogs in place. Thus, there are a total of six stoplog bays with a total effective weir length of 30.8 feet. The pier and training walls are constructed on top of a 20 feet wide concrete apron which extends the entire width of the channel bottom. The height from the top of the concrete apron to the top of the training walls is 12 feet. The downstream channel is covered with riprap which extends about 12 feet downstream from the edge of this concrete apron. A concrete service bridge, 4 feet wide and 18 inches thick, connects the pier and training walls above the stoplog bays. A split stone retaining wall runs perpendicular to the left training wall and terminates somewhere within the left earth abutment.

c. Size Classification. Intermediate (height - 15.5 feet; storage - 1880 acre-feet) based on storage (greater than or equal to 1,000 acre-feet and less than 50,000 acre-feet), as given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant Hazard. The discharge resulting from an assumed failure of the Pequawket Power Company Dam would cause an increase of about 1 foot in the downstream prefailure tailwater, bringing the water surface to a point approaching the sill of the restaurant supply business located near the right abutment. The potential for economic loss would exist.

e. Ownership. The original dam was owned by the Pequawket Power Company. In 1961, ownership was transferred to the state of New Hampshire, Water Resources Board, 37 Pleasant Street, Concord, New Hampshire 03301. *Telephone No. (603) 271-3406.*

f. Operator. The dam is maintained and operated by the state of New Hampshire Water Resources Board, Vernon A. Knowlton, Chief Engineer, 37 Pleasant Street, Concord, New Hampshire 03301. Telephone No. (603) 271-3406.

g. Purpose of Dam. The dam was originally constructed to generate electricity for adjoining mills. The dam has been rebuilt and it presently serves recreational purposes.

h. Design and Construction History. It is not known when the original dam was built, but records on file at the state of New Hampshire Water Resources Board indicate that the dam washed out in 1922 and was rebuilt in 1923 as a wood "A" frame structure with split stone training walls. Extensive repairs were made to the wood members in 1952. Reconstruction of the dam in its present configuration was begun in 1969 and completed in 1970. The structure was designed by the state of New Hampshire Water Resources Board and was built by the state of New Hampshire Fish and Game Department. The design plans indicate the concrete dam is reinforced and built partially on earth and partially on the split stone remains of the previous dam that occupied this site. A set of design plans are on file at the state of New Hampshire Water Resources Board. No in-depth design calculations were found.

i. Normal Operating Procedures. The Pequawket Power Company Dam is used for the retention of Pequawket Pond, which is used for recreational purposes. The New Hampshire Water Resource Board owns and operates the dam. The normal operating procedure is described in detail in Section 4.1a.

1.3 Pertinent Data.

a. Drainage Area. The drainage area above Pequawket Power Company Dam covers approximately 27.2 square miles (nearly 17,400 acres), consisting predominantly of steeply sloping terrain surrounding numerous ponds and swampy areas which drain to the dam. The topography in the drainage basin ranges from over 2,000 feet (NVGD) at White Ledge Mountain to approximately 452.5 feet (NGVD) at the base of the dam. The majority of the basin is heavily wooded and generally undeveloped. The major concentrations of development which do exist are located near the center of Conway, adjacent to Route 16 and near lakes and ponds in the area. This development consists of both year-round and seasonal housing, as well as associated commercial and industrial development.

b. Discharge at Damsite. Discharge at the damsite occurs over the stoplog spillway. The invert of the permanent spillway crest (top of concrete apron) is set at an elevation of 452.5 feet (NGVD). The spillway measures about 36.8 feet between the training walls, with a 2 feet thick concrete pier dividing the spillway into two 17.4 feet long sections. These sections are each divided into three stoplog bays by vertical 12-inch wide I-beams. The six stoplog bays provide a total effective weir length of 30.8 feet. The eight (8) stoplogs that were installed in each bay ("typical" stoplog arrangement) resulted in a crest elevation of 457.3 feet (NGVD) and maintain a ponding elevation of about 458 feet behind the dam. The vertical I-beams are attached to the service bridge with removable pins and the bases of these beams are set into slots in the permant concrete spillway crest. Consequently, when the pins at the top are removed the I-beams will pivot and fall into the downstream channel, thereby providing a greater cross-sectional area available for discharge.

(1) Outlet works (conduits) - N/A

(2) Maximum known flood at damsite - unknown

(3) The ungated spillway capacity with eight stoplogs in place and the water surface at the top of the dam (Elevation 464.5 feet) was estimated to be 1,780 cfs.

(4) The ungated spillway capacity with eight stoplogs in place the water surface at the test flood elevation (Elevation 468.8 feet) was estimated to be 3,420 cfs.

(5) Gated spillway capacity at normal pool elevation - N/A

(6) Gated spillway capacity at test flood elevation - N/A

(7) The total spillway capacity at the test flood elevation (Elevation 468.8 feet) with eight stoplogs in place was estimated to be 3,420 cfs.

(8) The total project discharge at the top of the dam (Elevation 464.5 feet) with eight stoplogs in place was estimated to be 1,780 cfs.

(9) The total project discharge at the test flood elevation (Elevation 468.8 feet) with eight stoplogs in place was estimated to be 14,100 cfs.

c. Elevation (Feet NGVD) based on an elevation 458.0 shown on U.S.G.S. quad sheet assumed to be pool elevation at top of design stoplog elevation (nine stoplogs in place).

(1) Streambed at toe of dam - 449

(2) Bottom of cutoff - unknown

(3) Maximum tailwater - unknown

(4) Normal pool - 458

(5) Full flood control pool - N/A

(6) Spillway crest - 452.5 permanent crest (top of concrete apron)
457.3 "typical" stoplog arrangement

(7) Design surcharge (Original Design) - unknown

(8) Top of dam - 464.5

(9) Test flood surcharge - 468.8

d. Reservoir (Length in feet)

(1) Normal pool - 6,800

(2) Flood control pool - N/A

(3) Spillway crest pool - 6,625

(4) Top of dam - 7,325

(5) Test flood pool - 7,335

e. Storage (acre-feet)

(1) Normal pool - 290

(2) Flood control pool - N/A

(3) Spillway crest pool - 198

(4) Top of dam - 1,880

(5) Test flood pool - 3,130

f. Reservoir Surface (acres)

(1) Normal pool - 143

(2) Flood control pool - N/A

(3) Spillway crest - 122

(4) Test flood pool - 410

(5) Top of dam - 335

g. Dam

(1) Type - concrete stoplog spillway structure between earthen embankments

(2) Length - 45 feet

(3) Height - 15.5 feet

(4) Top width - N/A

(5) Side Slopes - upstream slope, N/A; downstream slope, 2.0V to 1.0H

(6) Zoning - unknown

(7) Impervious Core - unknown

(8) Cutoff - Reinforced concrete, depth unknown

(9) Grout curtain - none

(10) Other - none

h. Diversion and Regulating Tunnel

Not Applicable (See Section j)

i. Spillway

(1) Type - concrete with wood stoplogs

(2) Length of weir - 6 stoplogs bays with effective weir length of 30.8 feet

(3) Crest elevation - 452.5 (permanent crest, top of concrete apron) 457.3 ("typical" stoplog arrangement)

(4) Gates - N/A

(5) U/S Channel - The channel immediately upstream from the spillway consists of a bridge opening which measures approximately 25 feet wide by 11 feet deep to the channel bottom. The sides of the bridge opening were constructed of split stone masonry with mortared joints. The bottom appeared to consist of the natural stream bed. It appears that this opening would not severly restrict the flow through the spillway. Upstream from the bridge opening the channel is wide and unobstructed. The slopes appear to be stable.

(6) D/S Channel - The spillway discharges into a natural stream channel below the dam. The bottom of the channel is covered with boulders and cobbles. Trees overhang the channel on both sides, but the channel is generally wide and unobstructed.

j. Regulating Outlets

(1) There are no regulating outlets.

SECTION 2
ENGINEERING DATA

2.1 Design

A set of plans dated 1969 showing plan, elevation, and section for the reconstruction of the dam are available at the state of New Hampshire Water Resources Board. No in-depth engineering calculations, as-built drawings, or specifications were found.

2.2 Construction

No construction records are available for use in evaluating the dam. Records from the state of New Hampshire Water Resources Board indicate reconstruction of the dam began in late 1969 by the state of New Hampshire Fish and Game Department and was completed in early 1970.

2.3 Operation

No engineering operational data were found.

2.4 Evaluation

a. Availability. Reconstruction of the Pequawket Power Company Dam was designed by the state of New Hampshire Water Resources Board. Other than the plans described above, no additional engineering data were found to be available.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Validity. The field investigation indicated that the external features of the Pequawket Power Company Dam substantially agree with those shown on the furnished plans. The only apparent difference is that on the day of inspection, 4.8 feet of stoplog were in place, not 5.5 feet as shown on Sheet No. 1 "Elevation of Pier" Detail.

It should be noted that on page 3 of the plans, all changes in details and dimensions to "Elevation East Abutment", "Sidewalk Joint Detail", and "Typical Stanchion Beam" Detail encircled and labeled with the word "out" refer to details apparently removed for Horn Pond Dam. These details apparently continue to apply to Pequawket Power Company Dam. Visual inspection confirmed the existence of the sidewalk joint and the handrail. It was not possible to confirm the reinforcing steel configuration.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The Pequawket Power Company Dam impounds a pond of intermediate size. The watershed above the dam consists predominately of steeply sloping terrain surrounding numerous ponds and swampy areas which drain to the dam. The drainage basin is heavily wooded and generally undeveloped, except for the perimeter of the lakes and ponds in the area, the Route 16 corridor, and the downtown Conway area. The downstream area is predominately undeveloped.

The field inspection of Pequawket Power Company Dam was made on June 9, 1980. The inspection team consisted of personnel from S E A Consultants Inc. and Geotechnical Engineers, Inc. Inspection checklists, completed during the visual inspection, are included in Appendix A. At the time of inspection, 4.8 feet of stoplogs were in place and water was passing approximately 5 inches deep over the spillway. The pool elevation was at approximately 457.7 NGVD. The upstream face of the dam could only be inspected above this water level.

b. Dam. Pequawket Power Company Dam is a concrete stoplog spillway structure located between earthen abutments. The dam is approximately 15.5 feet high from the channel bottom at the toe of the dam to the top of the training walls with an overall length of nearly 45 feet. The spillway measures about 36.8 feet between concrete training walls with a 2 feet thick concrete pier located in the center providing two openings, each about 17.4 feet long. These openings are each divided into three stoplog bays by vertical 12-inch wide I-beams which hold the stoplogs in place. Thus, there are a total of six stoplog bays with a total effective weir lengh of 30.8 feet (See Photo No. 2). The pier and training walls are constructed on top of a 20 feet wide concrete apron which extends the entire width of the channel bottom. The height from the top of the concrete apron to the top of the training walls is 12 feet. The downstream channel is covered with riprap which extends about 12 feet downstream from the edge of this concrete apron. A concrete service bridge, 4 feet wide and 18 inches thick, connects the pier and training walls above the stoplog bays (See Photo No. 3). A split stone retaining wall runs perpendicular to the left training wall and terminates somewhere within the left earth abutment (See Photo No. 4).

It appears that the training walls of the concrete stoplog-spillway were poured directly against the stone-masonry training walls at the ends of the dam that previously occupied this site. The concrete apron on the bottom of the structure appears to have been poured directly on top of concrete and stone rubble, which apparently is also the remains of the previous dam. No signs of instability of the concrete-and-stone rubble foundation or of the original stone-masonry training walls were observed at the time of the inspection.

It appears that the foundation under the concrete and split stone is soil. Minor seepage was discharging from the split stone retaining wall that runs perpendicular to the left training wall and terminates in the left abutment (See Photo No. 5).

A longitudinal crack has developed in the top of the left span of the concrete service bridge near the downstream edge. The location of this crack coincides with the location of a 10-inch I-beam embedded in the downstream edge of the service bridge (See Plans and Details in Appendix B).

Some erosion of the concrete training walls has taken place on the downstream toe of the dam where it joins the concrete apron (See Photo No. 6).

There is soil fill between the ends of the concrete stoplog-spillway structure and the abutments. At the left abutment, there has been some erosion of this fill, apparently due to runoff from an adjacent parking lot (See Photo No. 4). Brush and small trees are growing on this fill. At the right abutment, no evidence of erosion was observed, but there is little grassy vegetation to prevent erosion if the dam should be overtopped. Some brush is growing on this fill. There is a wooden building about 20 feet from the end of the concrete stoplog-spillway structure on the right abutment. The concrete foundation wall of this building comprises the right bank of the channel for a distance of about 50 feet downstream from the dam (See Photo No. 7).

There were two logs and an old tire in the water behind the stoplogs. There were five large logs on the concrete apron downstream of the stoplogs (See Photo No. 2).

c. Appurtenant Structures. There are no appurtenant structures incorporated into this dam.

d. Reservoir Area. The slopes of the reservoir appear to be stable. No evidence of significant sedimentation was observed. The approach channel to the dam is slightly constricted by the opening under the highway bridge immediately upstream of the dam, but is wide and unobstructed upstream of the bridge. There are no trees overhanging the approach channel for a distance of a few hundred feet upstream from the dam.

e. Downstream Channel. The bottom of the downstream channel is covered with boulders and cobbles. Trees overhang both sides of the channel, but the channel is wide and unobstructed. As noted above, there were five large logs on the spillway apron immediately downstream of the stoplogs.

3.2 Evaluation

On the basis of the results of the visual inspection, Pequawket Power Company Dam is considered to be in fair condition.

Minor seepage through the split stone wall at the left abutment could cause internal erosion in the abutment soil if not corrected.

A longitudinal crack in the left span of the concrete service bridge coinciding with the location of a 10-inch I-beam embedded in the service bridge could result in failure of the stoplog support structure. The 10-inch I-beam anchors the top of the 12-inch wide stanchion beams which hold the stoplogs in place. Further propagation of this crack could cause failure of the I-beam embedment which would result in the failure of the stanchion beams and thus failure to support the stoplogs.

Erosion of the concrete training walls at the downstream toe of the dam, which if continued, could effect the stability of the training walls.

Some surface erosion of the soil on the downstream side of the left abutment could result in breaching through that abutment if not corrected.

The general lack of surface erosion protection on both abutments makes the abutments susceptible to erosion if the dam should be overtopped.

A minor amount of debris collected on the upstream side of the stoplogs could trap other debris and reduce the spillway capacity.

Brush and small trees growing on the left abutment and brush growing on the right abutment could cause a seepage and erosion problem as they grow larger, if a tree blows over and pulls out its roots, or if a tree dies or is cut and its roots rot.

SECTION 4
OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. The Pequawket Power Company Dam is used for the retention of Pequawket Pond. The normal operating procedure for this dam during the summer months is to have a dam operator from the New Hampshire Water Resource Board visit the dam about 2 to 3 times per month and report gage readings back to the main office of the New Hampshire Water Resource Board in Concord. Engineers at the main office, in turn, direct any manipulation of stoplogs necessary to regulate the storage or release of water in order to maintain the seasonal pond level at elevation 457.5 feet ± (NGVD).

The operating procedure for the winter months is to draw down the pond after November 1. This is accomplished by removing all stoplogs from two bays and removing two stoplogs in each of the remaining four bays. All stoplogs are replaced after spring runoff.

Emergency operating procedures consist of removing as many stoplogs as possible during flood conditions and, if the dam is threatened, pulling the four pins and allowing the stanchions supporting the stoplogs to fall into the downstream channel. Conditions that would require pulling the pins have not occurred to date.

It should be noted that, according to the operational log kept by the dam operator for the New Hampshire Water Resource Board, few, if any, visits are made to the dam by the operator between the time that stoplogs are removed in November and replaced in the spring (See Appendix B, Operational Log).

b. Description of Any Warning System in Effect. No written warning system exists for the dam.

4.2 Maintenance Procedures

a. General. The owner, the New Hampshire Resource Board, is responsible for the maintenance of the dam. The maintenance procedure for this dam is to have the dam operator visually inspect the dam while performing normal operating procedures (See Section 4.1a). As a result of these visits, dam maintenance is performed on an as-needed basis.

b. Operating Facilities. There are no operating facilities incorporated into this dam.

4.3 Evaluation

The current operational and maintenance procedures for the Pequawket Power Company Dam are inadequate to insure that all problems encountered can be remedied within a reasonable period of time. The owner should continue with the present operational and maintenance procedure of visiting the dam 2 to 3 times per month in the summer. In addition, the owner should perform inspections at least once a month in the winter, as well as established a warning system to follow in event of flood flow conditions or imminent dam failure.

SECTION 5
EVALUATION OF HYDROLOGIC/HYDRAULIC FEATURES

5.1 General. Pequawket Power Company Dam consists of a concrete stoplog-spillway structure located between earthen abutments. The dam is approximately 15.5 feet high from the channel bottom at the toe of the dam to the top of the training walls with an overall length of nearly 45 feet. The spillway measures about 36.8 feet between concrete training walls with a 2 feet thick concrete pier located in the center providing two openings, each about 17.4 feet long. These openings are each divided into three stoplog bays by vertical 12-inch wide I-beams which hold the stoplogs in place. Thus, there are a total of six stoplog bays with a total effective weir length of 30.8 feet. Immediately upstream from the dam is a highway bridge opening which measures approximately 25 feet wide by 11 feet high. It appears that this culvert would not represent a severe upstream flow restriction.

The drainage area consists of predominantly steeply sloped terrain surrounding numerous ponds and swampy areas in the upper part of the basin. Consequently, stormwater deposited in the upper portions of the drainage area would be intercepted by these ponds and swampy areas before flowing to the dam. The dam is classified as intermediate in size, having a maximum storage of 1880 acre-feet.

5.2 Design Data. No hydrological or hydraulic design data were disclosed.

5.3 Experience Data. No experience data were disclosed. Maximum flood flows or elevations are unknown.

5.4 Test Flood Analysis. Due to the absence of detailed design and operational information, the hydrologic evaluation was performed utilizing data gathered during field inspection, watershed size and an estimated test flood determined from the Corps of Engineers guide curves. For this dam (intermediate size and significant hazard), the test flood ranges from one-half the Probable Maximum Flood (1/2 PMF) to the full Probable Maximum Flood (PMF). The 1/2 PMF was selected for the analysis since the dam falls to the lower end of the intermediate size range. The drainage area consits predominantly of steeply sloping terrain. However, since numerous ponds and swampy areas are located in the upper portions of the basin, the "rolling" curve from the Corps of Engineers set of guide curves was used to estimate the maximum probable flood peak flow rate.

Based on an estimated maximum probable flood peak flow rate of 1,350 cfs per square mile and a drainage area of 27.2 square miles, the test flood inflow was estimated to be 18,400 cfs. The test flood was routed through the reservoir in accordance with the Corps of Engineers procedure for Estimating Effect of Surcharge Storage on Maximum Probable Discharge. The reservoir water surface was assumed to be at an elevation of approximately 458 feet (NGVD) prior to the flood routing. The routed test flood outflow was estimated to be 14,100 cfs. This analysis indicated that the dam crest would be overtopped by 4.3 feet. The maximum spillway capacity with the water level at the dam crest and the "typical" arrangement of stoplogs in place (eight) was estimated to be 1,780 cfs, which is only about 13 percent of the routed test flood outflow. The maximum spillway capacity with the water level at the dam crest and all stoplogs and stanchion beams removed was estimated to be 4,600 cfs, which is only about 33 percent of the routed test flood outflow, and the dam crest would be overtopped by 4 feet under these conditions.

5.5 Dam Failure Analysis. The impact of dam failure was assessed utilizing the "Rule of Thumb" Guidance for Estimating Downstream Failure Hydrographs published by the Corps of Engineers. The analysis covered a reach extending approximately 600 feet downstream. The prefailure discharge with the water surface at the dam crest is significant, so prefailure tailwater conditions were included in the hydrologic calculations and the dam failure analysis was conducted with the water surface at the dam crest. Under these conditions, it was determined that the routed dam failure discharge would significantly increase the hazard over the prefailure discharge tailwater. Based on this analysis, the Pequawket Power Company Dam has been classified as a significant hazard.

A breach width of 17.4 feet, which is nearly 40 percent of the total length of the dam and coincides with the length of one spillway section (three stoplog bays), and a failure of height of about 12 feet were used to determine the failure discharge. This discharge, combined with flow over the unfailed portion of the spillway, yielded a total failure discharge of 2,110 cfs. Discharge just prior to an assumed breach was estimated to be about 1,780 cfs.

An assumed failure of the dam would cause an increase of about 1 foot in the downstream prefailure tailwater, bringing the water surface to a point approaching the sill of the restaurant supply business located near the right abutment of the dam. The potential for economic loss would exist. Further downstream the channel profile widens and the stage of the failure discharge reduces significantly.

SECTION 6
EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual observations indicate the following potential structural problems:

a. Minor seepage through the split stone wall located behind the left training wall could cause internal erosion in the abutment soil if not corrected.

b. A longitudinal crack in the left span of the concrete service bridge coinciding with the location of a 10-inch I-beam embedded in the service bridge. This I-beam anchors the top of the 12-inch wide stanchion beams which hold the stoplogs in place. Further propagation of this crack could cause failure of the I-beam embedment which would result in the failure of the stanchion beams and thus failure to support the stoplogs.

c. Erosion of both concrete training walls at the downstream toe of the dam which, if continued, could affect the stability of the training walls.

d. Some surface erosion of the soil on the downstream side of the left abutment which could result in breaching through that abutment if not corrected.

e. General lack of surface erosion protection on both abutments which makes the abutments susceptible to erosion if the dam should be overtopped.

f. Brush and small trees growing on the left abutment and brush growing on the right abutment which could cause a seepage and erosion problem as they grow larger if a tree blows over and pulls out its roots, or if a tree dies or is cut and its roots rot.

6.2 Design and Construction Data

No information regarding the original design or construction of the dam was found.

6.3 Post-Construction Changes

In 1969, the wood "A" frame dam, with split stone training walls, was replaced with a reinforced concrete structure. The majority of the stone which comprised the old dam was left in place and the new concrete structure was cast integrally with the existing stone.

6.4 Seismic Stability

This dam is located in Seismic Zone 2 and, in accordance with the Phase I guidelines, does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination indicates that Pequawket Power Company Dam is in fair condition. The major concerns with respect to the integrity of the dam are:

(1) Minor seepage through the split stone wall located behind the left abutment

(2) A longitudinal crack in the left span of the concrete service bridge coinciding with the location of a 10-inch I-beam embedded in the service bridge which anchors the top of stanchion beams that hold the stoplogs in place

(3) Erosion of the concrete training walls at the toe of the dam

(4) Surface erosion on the downstream side of the left abutment

(5) Lack of erosion protection on both the left and right abutments which consist of soil

(6) Brush and small trees growing on the left abutment and brush growing on the right abutment

b. Adequacy of Information. The information available from the visual inspection and the hydraulic computations is adequate to identify the problems mentioned in 7.2. These problems will require the attention of a registered professional engineer qualified in the design and construction of dams who will have to make additional engineering studies to design or specify remedial measures. No additional information is needed for the purposes of this Phase I investigation.

c. Urgency. The owner should implement the recommendations in 7.2 and 7.3 within one year after receipt of this Phase I report.

7.2 Recommendations

The owner should retain a registered professional engineer qualified in the design and construction of dams to:

(1) Investigate the seepage through the split stone wall located behind the left training wall and design remedial measures if needed.

(2) Investigate the longitudinal crack in the left span of the concrete service bridge coinciding with the location of a 10-inch beam embedded in the service bridge and design remedial measures if necessary.

(3) Investigate the erosion of the concrete training walls at the toe of the dam and specify remedial measures if necessary

(4) Specify repairs for the erosion that has occurred on the downstream side of the left abutment

(5) Specify erosion protection for the soil abutments at both ends of the dam

(6) Perform a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam and the need for and the means to increase project discharge.

The owner should implement the recommendations made by the engineer.

7.3 Remedial Measures

a. Operating and Maintenance Procedures. The owner should:

(1) Remove trees and brush and associated root systems from abutments

(2) Continue with the present dam inspections 2 to 3 times per month in the summer as well as performing inspections at least once a month in the winter

(3) Engage a registered professional engineer qualified in the design and construction of dams to make a comprehensive technical inspection of the dam once every year

(4) Establish a surveillance program for use during and immediately after periods of heavy rainfall, establish written procedures to be followed during flooding periods, and also establish a formal downstream warning program to follow in case of emergency

7.4 Alternatives

There are no practical alternatives to the recommendations of Section 7.2 and 7.3

APPENDIX A
INSPECTION CHECKLIST

INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT: Pequawket Power Co. Dam, NH

DATE: June 9, 1980

TIME: 9:45 a.m.

WEATHER: Sunny, cool

W.S. ELEV. 457.7 U.S. 449.8 DN.S.
(NGVD)

PARTY:

1. Kenneth Stewart, S E A
2. Bruce Pierstorff, S E A
3. Robert Durfee, S E A
4. Philip Upton, S E A
5. Ronald Hirschfeld, GEI
6. _____
7. _____
8. _____
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Structural Stability	K. Stewart/R. Durfee	
2.	Hydrology/Hydraulics	B. Pierstorff/P. Upton	
3.	Soils and Geology	R. Hirschfeld	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

INSPECTION CHECK LIST

PROJECT: Pequawket Power Co. Dam, NH DATE: June 9, 1980

PROJECT FEATURE: Dam Embankment NAME: _____

DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	464.5
Current Pool Elevation	457.7
Maximum Impoundment to Date	Unknown
Surface Cracks	Minor hairline cracks in several concrete surfaces
Pavement Condition	Not paved
Movement or Settlement of Crest	None observed
Lateral Movement	None observed
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Some erosion of both concrete training walls at downstream toe
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	No evidence observed
Vegetation on Slopes	Brush and small trees on downstream side of left abutment; brush on downstream side of right abutment
Sloughing or Erosion of Slopes or Abutments	Some erosion on downstream side of left abutment
Rock Slope Protection - Riprap Failures	No riprap on slopes
Unusual Movement or Cracking at or near Toe	None observed
Unusual Embankment or Downstream Seepage	Minor seepage through the split stone wall located behind the left training wall
Piping or Boils	None observed
Foundation Drainage Features	None observed
Toe Drains	None observed
Instrumentation System	None observed

INSPECTION CHECK LIST

PROJECT: Pequawket Power Co. Dam, NH DATE: June 9, 1980

PROJECT FEATURE: Dike Embankment NAME: _____

DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	No Dike
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Vegetation on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	

INSPECTION CHECK LIST

PROJECT: Pequawket Power Co. Dam, NH DATE: June 9, 1980

PROJECT FEATURE: Intake Channel NAME: _____

DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	No intake structure
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

INSPECTION CHECK LIST

PROJECT: Pequawket Power Co. Dam, NH DATE: June 9, 1980

PROJECT FEATURE: Control Tower NAME: _____

DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	No control tower
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

INSPECTION CHECK LIST

PROJECT: Pequawket Power Co. Dam, NH DATE: June 9, 1980

PROJECT FEATURE: Transition and Conduit NAME: _____

DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	No transition or conduit
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

INSPECTION CHECK LIST

PROJECT: Pequawket Power Co. Dam, NH DATE: June 9, 1980

PROJECT FEATURE: Outlet Structure NAME: _____

DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	No outlet structure
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

INSPECTION CHECK LIST

PROJECT: Pequawket Power Co. Dam, NH DATE: June 9, 1980

PROJECT FEATURE: Spillway Weir NAME: _____

DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Not visible beneath water surface
b. Weir and Training Walls	
General Condition of Concrete	Good
Rust or Staining	None
Spalling	Some erosion of both training walls at downstream toe
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None visible
Drain Holes	None observed
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Trees overhanging discharge channel
Floor of Channel	Boulders and cobbles
Other Obstructions	Five logs lying on spillway discharge apron
Other Comments	

INSPECTION CHECK LIST

PROJECT: Pequawket Power Co., Dam, NH DATE: June 9, 1980

PROJECT FEATURE: Outlet Works - Service Bridge NAME: _____

DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	Service bridge is concrete slab above stoplog bays
a. Super Structure	
Bearings	Not applicable. Service bridge integrally poured with training walls.
Anchor Bolts	None
Bridge Seat	Not applicable - see bearings
Longitudinal Members	Not applicable, slab is reinforced concrete
Under Side of Deck	Concrete - good condition
Secondary Bracing	None
Deck	Concrete - one longitudinal hairline crack in top surface of left span
Drainage System	None
Railings	Downstream side only
Expansion Joints	One over center pier
Paint	Railing in good condition, stanchion beams could use some paint
b. Abutment & Piers	
General Condition of Concrete	Good
Alignment of Abutment	Good
Approach to Bridge	Good
Condition of Seat & Backwall	Good

APPENDIX B

ENGINEERING DATA

AVAILABLE ENGINEERING DATA

A set of plans dated 1969 by the New Hampshire Water Resources Board, showing plan, elevation, and section for reconstruction of the dam were obtained from the New Hampshire Water Resources Board, Concord, New Hampshire. A copy of the dam's operational log was also obtained from the state of New Hampshire Water Resources Board. No in-depth engineering calculations, as-built drawings, or specifications were found.

PAST INSPECTION REPORTS

DATE May 9, 1969

FROM Francis C. Moore

SUBJECT Pequawket Pond Dam

TO Vernon A. Knowlton

On May 6, 1969, I visited Pequawket Pond dam in the center of Conway Village. The top part of the wood spillway on the left of the sluiceway is badly disintegrated. There is some disintegration of the level section to the right of the sluiceway (12' long - 2 1/2' wide) but it does not affect level of the pond. Also, the right side does not leak appreciably as it has earth and stone fill against it.

The break on the left is between 9 and 11 feet wide and tapers down to 3' near the lower end of the sluiceway. Two A frames holding the wood facing on the left of sluiceway has disappeared or moved several feet out of line at the top of spillway. The third A-frame is not secure at the top and the downstream vertical post tips several inches downstream.

To temporarily seal the spillway, a timber 14' to 16' long across the top of spillway near the sloping face could be securred to the spillway. Vertical planking (2 layers) with joints overlapped could extend down from this heavy timber to cover the hole.

This spillway should be replaced with a concrete or stop log type spillway at the earliest possible date.

Suggested material list:

16' - 6" x 12" timber for top wholer
240 bf of 2" x 8" or 2" x 10" planking - 12'± long.

FCM/jb

July 12, 1967

Mr. John Hutchins
Albany
New Hampshire

Dear Mr. Hutchins:

In response to your letter regarding leakage at the outlet dam to Pequawket Pond, the Water Resources Board Operator of Dams investigated the situation on July 11, 1967.

He found that one of the lower wooden stoplogs had evidently rotted and was causing most of the leakage. A new plank was placed in the rotted area to stop the loss of water. When the water is lowered in the fall, the Board will inspect the structure to determine what repairs are needed to maintain the dam.

Thank you for informing the Water Resources Board of this problem. If you have further questions or information on this dam, feel free to contact us any time.

Very truly yours,

Robert W. Livingston
Civil Engineer

rwl:c

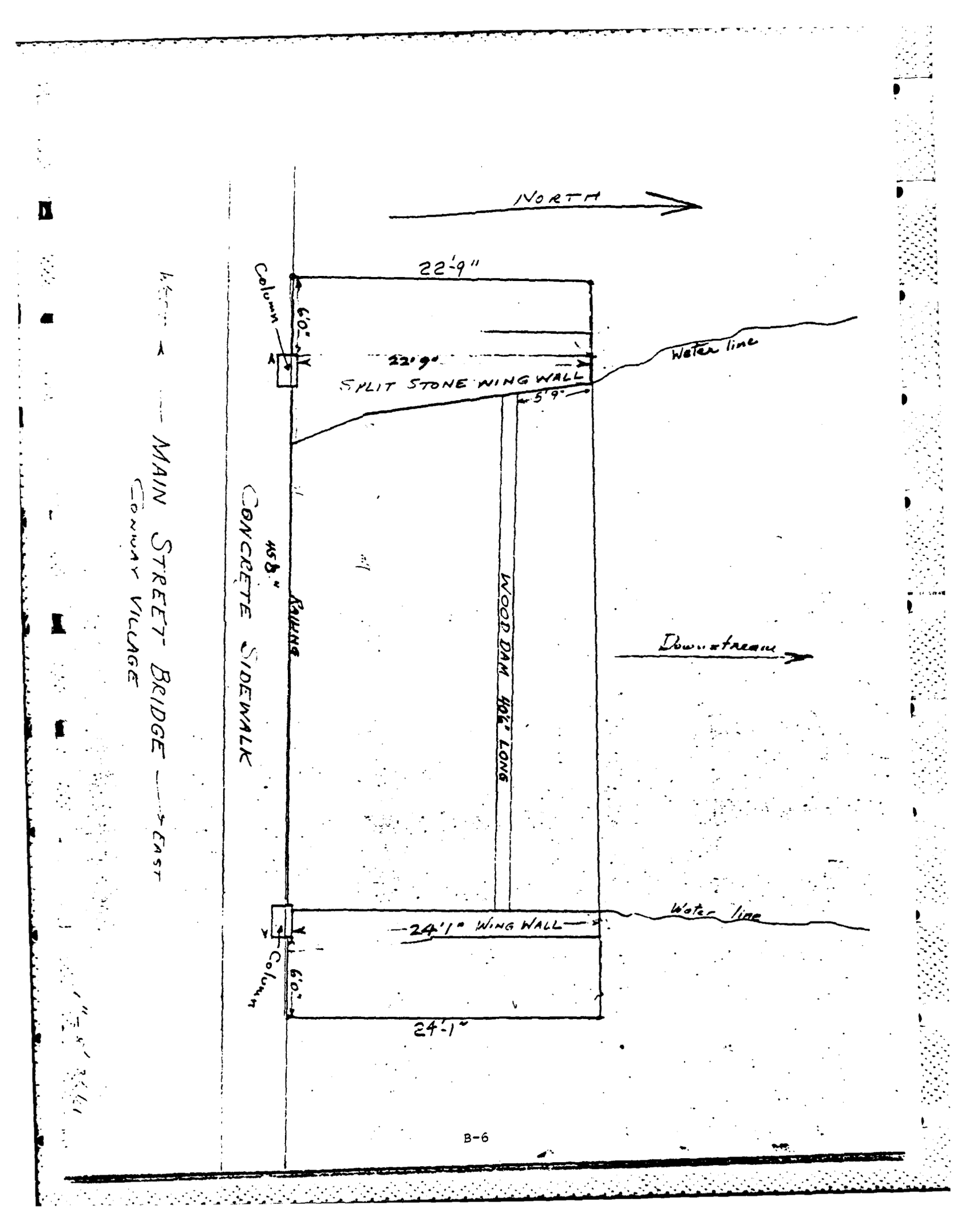
Final Report on Unauthorized Operation of the Pequawket Dam in Conway, N. H.

Friday, June 9, 1961

Arriving at the State-owned dam on Pequawket Pond, Conway, N. H., I found that new stop logs had been placed on the dam closing the opening completely. The pond water level was 8" below the spillway crest.

I contacted Mr. Hale on the status of the repairs to the water line under the pond and he informed me that the repair work has been abandoned and a new by-pass line was being installed - eliminating the need of lowering the pond further.

Vernon A. Knowlton
Civil Engineer


NORTH
22'-9"
Column
6'0"
22'-9"
SPLIT STONE WING WALL
5'9"
Water line
WOOD DAM 40½" LONG
Downstream
45'-8"
CONCRETE SIDEWALK
RAILING
24'-1" WING WALL
Water line
Column
6'0"
24'-1"
MAIN STREET BRIDGE → EAST
CONWAY VILLAGE

PEQUAWKET DAM, Conway, N. H.

Water surface at rear of Kennett's was 0.45' lower on 6/23/60. Water surface now is 90.04' at Kennett's. Elevation desired at Cotton's is 1.90' higher than present water surface- or 91.94' elevation; 1.45' higher than on Monday, June 20, 1960.

Dam width is 40.5 feet with west abutment flaring out somewhat and straight on east abutment.

Assuming 27.4 square mile drainage area and 0.3 cfs/sq. mi. runoff, 8.2 cfs or greater would occur on the average all but posibly 7 days a year. The leakage in the dam is at least this amount and probably cannot be easily reduced much. From this information, the spillway should be cut about 1'-1½" as shown on accompanying plan.

NOTES ON DAM:

Dam has eight bents between 9 A-frames in 22.0 feet on the east end of the dam to the 4.7' wide sluiceway. From the sluiceway opening to the west abutment, there are five bents between 6 A-frames in 13.8 feet. One foot of water on spillway is 135 cubic feet per second or 5 cfs/sq. mi.

At the sluiceway 9" beyond line of other posts, two posts are side by side in line with other posts. On the west end of sluiceway, there are two 6"x9" posts with the downstream posts set 9" beyond line of other posts. Also a 2"x8" is scabbed to the rear post.

At third points of east section of spillway, and next to sluiceway, three one inch steel rods run diagonally and parrallel to upstream face of dam through the horizontal whaler on top of posts. There are also two steel rods on the west side of the sluiceway, one near sluiceway and one at mid point.

The sluiceway is side-planked with double 2" planks at top 2 or 3 feet with only single planking below. There is a 3" wide opening in planking on the west side above the mid point.

The third vertical post from the sluiceway going west has leaned downstream 4".

There is some leakage through the planking but not really serious. At times of draught, the sluiceway should be completely shut off.

Top ends of diagonal timbers that are planked are partially rotted off to the whalers on the vertical posts. Some diagonals are transfering no load to top of vertical posts. The planking, braces, whalers, vertical posts are sound. The top horizontal flooring is gone on the east end and partially gone on the west end.

Conway, New Hampshire
September 2, 1952

Mr. Walter G. White, Chairman
Water Resources Board, State of N. H.
Ossipee, New Hampshire

Dear Mr. White:

In accordance with your letter of August 29, 1952, and our telephone conversation this morning, enclosed please find application blank for repair of a dam at Conway.

As I told you, this work has been done. All the old uprights in the dam were removed and replaced by 8x10 hemlocks. The old planks from the top to within five feet of the bottom of the dam were removed and replaced by 2x10 hemlock planks laid double.

If you need any further information, please advise.

Very truly yours,

The Pequawket Power Company

Treas.

Form WCC. 1
7/30/37

THE STATE OF NEW HAMPSHIRE

County of Carroll, ss. September 2 19 52

PETITION FOR APPROVAL OF THE CONSTRUCTION OR

REPAIR OF DAM AT Conway, New Hampshire

TO THE WATER CONTROL COMMISSION:

In compliance with the provisions of Laws of 1937, c. 133, an Act establishing a Water Control Commission,

We, the Pequawket Power Company, of Conway, N.H. a partnership
I, (Here state name of person or persons, partnership, association, corporation,

etc.)

hereby petition the Water Control Commission ~~for approval to construct, to reconstruct~~, to make repairs to, a dam along, or (cross out portion not applicable) across Pequawket Pond
(Here state name of stream or body of water)

at a point in Conway Village on Route 16 in the Town of Conway, N.H.
(Here give location, by distance from mouth of stream, county

or municipal boundary)

in the town (s) of

in accordance with PRELIMINARY PLANS, and SPECIFICATIONS FILED WITH THIS APPLICATION and made a part hereof.

Form WCC. 1-p. 2
7/30/37

The purpose of the proposed construction is to make necessary repairs
(Here briefly state use to

to dam
which stored water is to be put)

The construction will consist of putting in necessary new braces and
(Here give brief description of work con-

supporting timbers and boards on dam, to maintain its use
templated including height of dam)

All land to be flowed is not / is owned by applicant.

Pequawket Power Company

Treas.

Address Conway, N. H.

Note: This application together with plans, specifications and information and data filed in connection herewith will remain on file in the office of the Water Control Commission.

June 28, 1946

Case 52.02

Pequawkett Pond Outlet, Conway, N. H.

The condition of this dam is fair. Some recent repairs have been made to the abutments. The timber "A" frame dam will require some new planking within a few years, - but not necessary to be done immediately.

Leonard R. Frost
Engineer

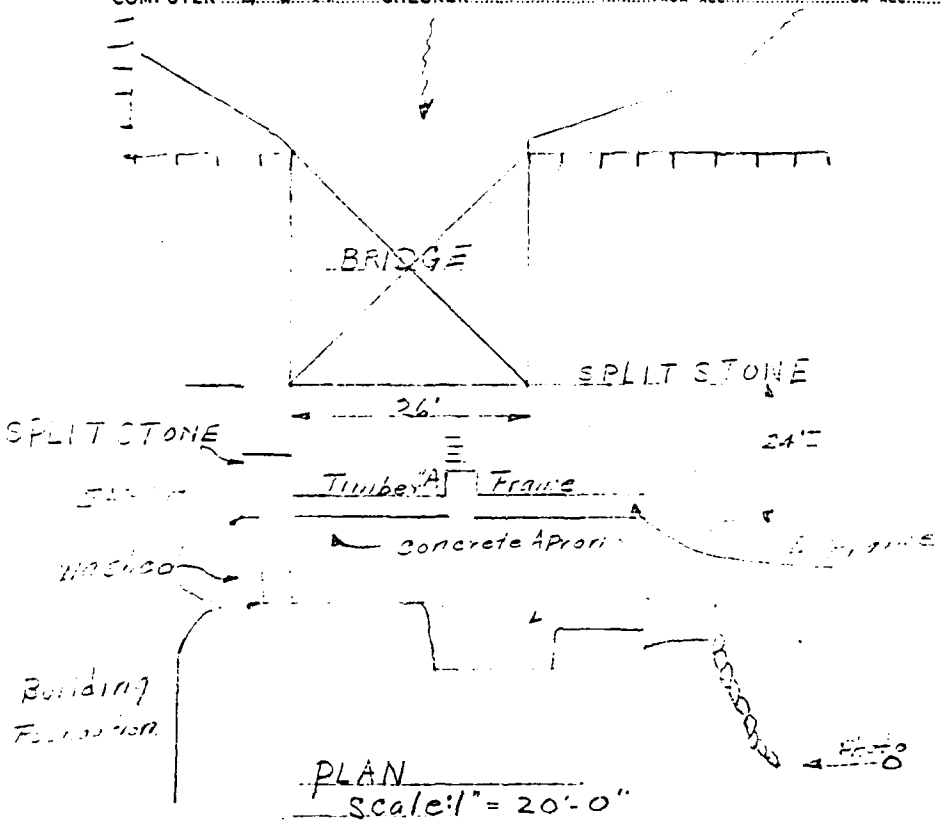
FORM E2 8252

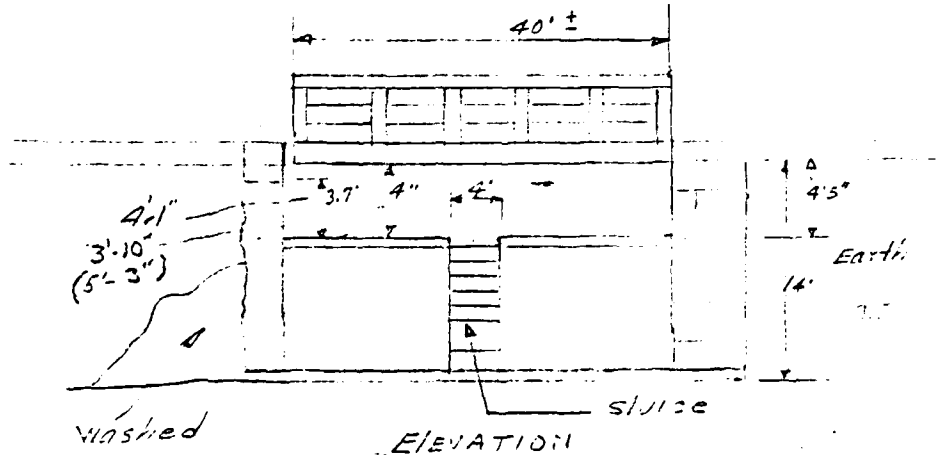
NEW HAMPSHIRE
WATER RESOURCES
BOARD
CONCORD, N. H.

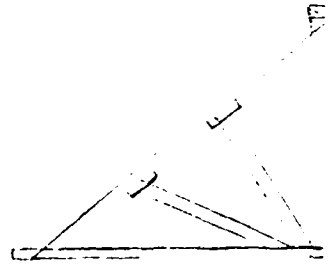
PROJECT ..... FILE .....

SUBJECT ..... ACC .....

COMPUTER ..... CHECKER ..... CONT. FROM ACC. ..... CONT. ON ACC. ..... SUMMARY ON ACC. ..... DATE .....







X Section

7204

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON DAMS IN NEW HAMPSHIRE

LOCATION STATE NO. .....

Town .....: County .....

Stream .....

Basin-Primary .....: Secondary .....

Local Name .....

Coordinates—Lat. .....: Long. .....

GENERAL DATA

Drainage area: Controlled ..... Sq. Mi.: Uncontrolled ..... Sq. Mi.: Total 27.4 Sq. Mi.

Overall length of dam ..... ft.: Date of Construction .....

Height: Stream bed to highest elev. ..... ft.: Max. Structure ..... ft.

Cost—Dam .....: Reservoir .....

DESCRIPTION

Waste Gates

Type .....

Number .....: Size ..... ft. high x ..... ft. wide

Elevation Invert .....: Total Area ..... sq. ft.

Hoist .....

Waste Gates Conduit

Number .....: Materials .....

Size ..... ft.: Length ..... ft.: Area ..... sq. ft.

Embankment

Type .....

Height—Max. ..... ft.: Min..... ft.

Top—Width .....: Elev. ..... ft.

Slopes—Upstream ..... on .....: Downstream ..... on .....

Length—Right of Spillway .....: Left of Spillway .....

Spillway

Materials of Construction .....

Length—Total ..... ft.: Net ..... ft.

Height of permanent section—max. ..... ft.: Min. ..... ft.

Flashboards—Type None: Height ..... ft.

Elevation—Permanent Crest .....: Top of Flashboard .....

Flood Capacity ..... cfs.: ..... cfs/sq. mi.

Abutments

Materials: .....

Freeboard: Max. ..... ft.: Min. ..... ft.

Headworks to Power Devel.—(See "Data on Power Development")

OWNER .....

REMARKS .....

Tabulation By ..... Date .....

7205

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON RESERVOIRS & PONDS IN NEW HAMPSHIRE

LOCATION AT DAM NO. 5.2.02

Town Conway : County Coos

Stream Rocky Mount Pond Outlet

Basin—Primary Saco R. : Secondary Saco R.

Local Name

DRAINAGE AREA

Controlled ..... Sq. Mi.: Uncontrolled ..... Sq. Mi.: Total ..... Sq. Mi.

ELEVATION vs. WATER SURFACE AREA vs. VOLUME

	Point	Head Feet	Surface Area Acres	Volume Acre Ft.
(1)	Max. Flood Height			
(2)	Top of Flashboards			
(3)	Permanent Crest			
(4)	Normal Drawdown		146	
(5)	Max. Drawdown			
(6)	Original Pond	U.S.G.S. 485		

Base Used .....: Coef. to change to U.S.G.S. Base .....

RESERVOIR CAPACITY

	Total Volume	Useable Volume
Drawdown	ft.	ft.
Volume	ac. ft.	ac. ft.
Acre ft. per sq. mi.		
Inches per sq. mi.		

USE OF WATER Domestic- Recreation

OWNER Pequawkett Power Co Conway N H

REMARKS

Tabulation By A.A.M.A.P.A.T. Date Nov. 14, 1933.

Form F1A
9-42

PUBLIC SERVICE COMMISSION OF NEW HAMPSHIRE—DAM RECORD I-5241

TOWN	CONWAY	TOWN NO. 2	STATE NO. 53.12
RIVER STREAM	Pequawkett Pond Outlet		
DRAINAGE AREA		POND AREA 1243	
DAM TYPE	"A" Frame	FOUNDATION NATURE OF	Earth
MATERIALS OF CONSTRUCTION	Timber, Split Stone		
PURPOSE OF DAM	POWER—CONSERVATION—DOMESTIC—RECREATION—TRANSPORTATION—PUBLIC UTILITY		
HEIGHTS, TOP OF DAM TO BED OF STREAM	14'	TOP OF DAM TO SPILLWAY CRESTS	3'-7" - 4'-5"
SPILLWAYS, LENGTHS DEPTHS BELOW TOP OF DAM	40' Approx.	LENGTH OF DAM	Approx. 120'
FLASHBOARDS TYPE, HEIGHT ABOVE CREST	None		
OPERATING HEAD CREST TO N. T. W.		TOP OF FLASHBOARDS TO N. T. W.	
WHEELS, NUMBER KINDS & H. P.			
GENERATORS, NUMBER KINDS & K. W			
H. P. 90 P. C. TIME 100 P. C. EFF.		H. P. 75 P.C. TIME 100 P. C. EFF.	
REFERENCES, CASES, PLANS, INSPECTIONS			
REMARKS			

OWNER - Pequawket Power Company

CONDITION - Fair

MENACE - Yes. Will be subject to periodic inspection.

To the Public Service Commission:

The foregoing memorandum on the above dam is submitted covering inspection made July 14, 1936, according to notification to owner dated June 29, 1936, and bill for same is enclosed.

D. Waldo White
Chief Engineer

July 23, 1936
Copy to Owner

NEW HAMPSHIRE WATER RESOURCES BOARD

INVENTORY OF DAMS AND WATER POWER DEVELOPMENTS

DAM

BASIN Saco NO. 2 — — I-5241
RIVER Pequawkett Pond Outlet MILES FROM MOUTH ____ D.A.SQ.MI. ____
TOWN Conway OWNER Pequawkett [illegible] Co.
LOCAL NAME OF DAM ____
BUILT ____ DESCRIPTION 34' Frame — Timber Split Stone on Earth

POND AREA-ACRES 142 ac DRAWDOWN FT. ____ POND CAPACITY-ACRE FT. ____
HEIGHT-TOP TO BED OF STREAM-FT. 12 MAX. ____ MIN. ____
OVERALL LENGTH OF DAM-FT. 120± MAX.FLOOD HEIGHT ABOVE CREST-FT. ____
PERMANENT CREST ELEV.U.S.G.S. ____ LOCAL GAGE ____
TAILWATER ELEV.U.S.G.S. ____ LOCAL GAGE ____
SPILLWAY LENGTHS-FT. 40 ± FREEBOARD-FT. 3.4'± and 6.4'?
FLASHBOARDS-TYPE, HEIGHT ABOVE CREST None
WASTE GATES-NO. WIDTH MAX. OPENING DEPTH SILL BELOW CREST
— — — —
— — — —
— — — —

REMARKS Condition Fair
7F Into Pequawkett Rd, Saco R.

POWER DEVELOPMENT

UNITS	NO.	RATED HP	HEAD FEET	C.F.S. FULL GATE	KW	MAKE

USE Domestic Recreation

REMARKS Menace

DATE 7/14/36

OPERATIONAL LOG

PEQUAKET POND DAM

FULL LAKE 7.00 FT. MEASURED ON UPSTREAM SIDE OF MIDDLE PIER.

2 Logs Per Bay. 6 Bays across = 48 Logs Total.
Stops 4'x7'x5'11"

PEQUAWKET POND DAM DATA

Dam purchased on May 4, 1961 for $1.00 by the New Hampshire Water Resources Board. No major repairs needed as the crest had been rebuilt by the previous owners.

Upstream storage at Davis Pond - 28 Acres
Upper Pequawket Pond - 14 Acres
Little Pea Porridge Pond - 4 Acres
Middle Pea Porridge Pond - 43 Acres
Pea Porride Pond - 144 Acres
All natural storage ponds - (total 231 acres)

Pequawket Pond Area = 143 acres
" " drainage area = 27.4 sq. miles
Total drawdown = 6.79' ±
Spillway length = 40.5'
Stoplog width = 4.7'
Freeboard = 5.5'
Total estimated storage to full pond = 550 acre feet

15 year frequency flood = 1,060 cfs
100 " " = 2,590 cfs

Spillway capacity = 1,730 cfs

1" from total drainage area raises pond 48 inches (assuming upstream storage holds its share)

Flow over spillway (stoplogs in)

6"	-	47 cfs
12"	-	133 cfs
18"	-	245 cfs
24"	-	376 cfs
36"	-	692 cfs
48"	-	1064 cfs

Increses by Sluiceway discharges

Depth of stoplogs out at no flow over spillway

12"	-	16 cfs
24"	-	45 cfs
36"	-	82 cfs

Depth of stoplogs out at 12" flow over spillway

12"	-	39 cfs
24"	-	68 cfs
36"	-	95 cfs

Boards = 2" x 8" x 6'
(Stream cut)

NEW HAMPSHIRE WATER RESOURCES BOARD CONCORD N. H.

PROJECT [illegible] FILE

SUBJECT ACC.

COMPUTOR CHECKER CONT. FROM ACC. CONT. ON ACC. SUMMARY ON ACC. DATE

11/3/61- Pulled 5 staples. Water 3" over Spillway. Left last three boards downstream (2 in bank) MCK

12-62 Water 8½" over Spillway. Too much flow to put in boards. MCK

5-24-62 [illegible] MCK

[illegible] MCK

[illegible] MCK

[illegible] MCK

11-20-62 Water even with top of Spillway. Pulled one Board (5 out) MCK

5-17-62 Put in 5 boards — 2 out that were removed by unknown Fed personnel. Water approx. 14" below Spillway & Spilling enough for fish flowage. Talked with M. Lovejoy of Conway Fish Agency, about his field being unable to drain. MCK

6-4-63 Put in 3½ Boards to bring opening up to crest of Spillway. Water 2" over spillway. Cleaned debris off dam. MCK

8-3-63 Water just over spillway. Checked complaint on closing off stream in cemetary by the town.

8-4-63 Water just over spillway. MCK

10-24-63 Pulled 6 boards — Water ¼" over Spillway prior to removal. MCK

3-4-64 Water 1' below Spillway. Approx. 4' through board section. MCK

5-6-64 Pulled large log out of stoplog section & put in 4 boards - (4 out) Water 6" below Spillway crest. Cleaned other debris from area. MCK

5-20-64 Pulled log from stoplog section & cleaned debris from Spillway. Water 5" over Spillway. Could not put in last 4 boards yet. MCK

NEW HAMPSHIRE WATER RESOURCES BOARD CONCORD, N. H.

PROJECT ..... FILE .....

SUBJECT Pequawket Pond ACC. .....

COMPUTOR ..... CHECKER ..... CONT. FROM ACC. ..... CONT ON ACC. ..... SUMMARY ON ACC. ..... DATE .....

Date	Spillway	Notes	Name
6-1-64		Put in 4 boards - Water 3" below spillway.	M.E.K.
7-6-64		Mr. Frost checked dam - O.K.	M.E.K.
7-31-64		Water just over spillway - O.K.	V.A.K.
8-26-64		Water 1.5" Over spillway	V.A.K.
11-6-64		Water even with top of spillway - Pulled 6 boards	M.E.
1-22-65		Water approx. 2' below top of spillway - no obstructions	M.E.
5-7-65		Put in 6 boards - Cleaned logs and debris out of stoplog section. Water drizzling over spillway.	M.E.K.
10-20-65		"Buz" Coleman called & requested early drawdown for shore work. Pulled 6 boards - 2 or 3 left — +1" over crest.	M.E.K.
5-19-66		1½ feet below crest. Put in 10 boards - dam free of debris.	M.E.K.
Labor Day		- Pond was drawn down at request of town to lay water line & then refilled — Inconc.	
11-1-66		+2" over crest. Pulled 6 boards & cleaned debris off dam.	M.E.K.
5-31-67		Water flowing through Weir	R.W.L.
6-8-67		PUT IN 7 BOARDS WATER ± 18" BELOW SPILL WATER BELOW 4 OF THE BOARDS	M.C.
7-11-67		2ND BOARD FROM BOTTOM BROKEN REPLACED (SOME LEAKAGE) 15 CFS	M.C.
8-2-67		EVEN WITH SPILL	M.C.
5-14-68		Replaced top two Stop logs one 7" — one 4"	W.H.J.
11-1-67		PULLED OUT THE 6 BOARDS O.K. FOR WINTER — 48" TO BOARDS	M.C.
2-14-68		Water flowing through spillway	R.L.
4-9-68		Cleaned Stoplog area tonight & put in logs	W.H.J.
5-7-		— 2.0 BELOW SPILL ALL BOARDS SET COULD NOT PUT IN BOTTOM TWO PUT IN ALL BOARDS (12) UNDER WATER 6 OUT OF WATER	M.C.
5-15-		— 2.4 " "	M.C.
7-7-68		4"± over spillway to center in) - Stop on Stop Log ½"	R.L.
9-12-68		Replaced 3 Stoplogs.	W.H.J.
10-4-68	— 1.25'	Below Spillway All Stoplogs IN	W.H.J.
11-7-68	+ 0.20'	Over Spillway Pulled 4 Stoplogs	W.H.J.
12-13-68	— 0.7	PUT IN IRON POST FOR FENCE FENCE NOW FIXED PULLED OUT 1 STOP NOW 6 OUT SET FOR WINTER	W.H.J. M.C.
4-23-69	+ 1 or more	Top planks each side of stoplog section out about 2" down on right for 10' & 4" down on left for 2'	E.C.H.
5-6-69	— 0.7	Checked condition of dam & made report of damage.	E.C.H.
12/69		Stop [illegible] Pulled [illegible]	[illegible]

NEW HAMPSHIRE WATER RESOURCES BOARD CONCORD, N. H.

PROJECT / SUBJECT: Pequawket Lake — CENTER PIER

9 Logs Deep — 6 BAYS

? ± 7.0 BELOW CENTER PIER FULL LAK.

COMPUTER / CHECKER / CONT. FROM ACC. / CONT. ON ACC. / SUMMARY ON ACC. / DATE / FILE / ACC.

5-2-70		Put in 47 Logs. Notched ends + Tightened Screw Eyes	LJM
	23"	of water. [illegible]	
[illegible]-70	5" +	LARGE QUANTITY OF DEBRIS RESTRICTING FLOW REMOVED 4 OR 5 LOGS FROM CTR. BAYS & MOST OF DEBRIS EXCEPT FOR 3 LARGE LOGS ON THE UPSTREAM SIDE & 1 LOG ON TOP OF STOPLOG 1 BAY. LEFT NOTE TO MRS. BRITCHIE CRANMORE DRIVE THAT POND WILL RECEDE.	D.M.
8-5	-7 FT 5 IN	PULLED OUT 2 STOPS IN TOP ROW, PUT IN 15 SAND BAGS TO STOP LEAK (LK IS = 6.8 ±)	MC
8-14	-6 FT 11"		MC
9-2-70	-6.75	Leveled Stop Log house. Installed Locking Devices	LJM
		Removed Large Log From 2nd Bay	LJM
9-4-70	-	5" over 2 bays	FCM
10-5-70	-6.68	Took out 3 Logs From #2 Bay (making 4 Logs out of This bay)	LJM
10-7-70	-7.35	Took out 3 Logs From #2 Bay (making 7 Logs out)	LJM
11-7-70	-8.3	4 bays have stops 26" out of water, 1 with 18½" out of water. [illegible]	FCM
3-25-71	-8.9	Pulled Last Bay Down To one Log	LJM
4-30-71	-7.1	Removed 2 Logs From bays. 2 Large Logs caught in Dam	LJ
5-25-71	-9.3	Level is -2.7' below full pond. All stops in - Minor leakage only	LJM
[illegible]-6-71	-8.0	1.3" " "	LJM
June 8, 71		+0.1 over Stop Logs (Lots of TRASH)	[illegible]
7/7/71	-7.9	+0.2 " " " Center stops in both bays out.	FCM
7/16/71		There are many logs in front of dam south section, including tires, debris, etc. Level 0.3' below full pond. Only 1 log even w/ stops except center bays, only 1 log out each bay in such bay. 2 stop logs have no locking device, [illegible]	FCM
[illegible]		[illegible]	[illegible]
8/16	-6.7	PULLED OUT (2) STOPS (4) OUT IN BOX CUT BRUSH	MC
[illegible]	-6.7	-.15 BELOW 3 BAYS [illegible] OVER 3 BAYS	D.M.
11-1	-6.6	CLEANED DEBRIS. PULLED (4) OUT IN 2 BAYS (1) OUT IN 2 BAYS (10/16) OUT IN BOX	MC
11-10		" (7) " " " 2 BAYS HAVE 2 IN	MC
11-11	@ PIER -9.7	-3.7 FT. BELOW FULL POND. 1 OUT IN 2 BAYS, 4 OUT IN 1 BAY, 32 IN BOX	D.M.
1-6-72	-10.1	PULLED (6) 2 BAY HAVE 1 IN 4 IN IN 1 BAY	MC
2-25		+0.05 or LOGS IN 2 BAYS COFFER DAM HAS SHALLOW (5 FT) OPENING	MC
3-10-72	-10.5	Audley To Be all out of Lake By 3-17-72	LJM
5-26		PUT IN ALL LOGS (FOR COLEMAN)	MC
5-30	-6.75	PULLED 9 LOGS IN 3 BAYS	MC
6-2-72	-7.0	PUT IN 9 Logs (All In) Removed 1 Large + 1 Small Logs From Bay area (Trash Logs)	LJM
6-14-72	-6.55	+0.5 OVER Boards	[illegible]

PEND-WKET

7-21	-7.1	CLEANED OUT ALL DEBRIS (11 LOGS 14 BARRELS)	MC
7-31-73	-6.6	All of Log Coming Down Stream (Log Stuck in Sect. 1 & 2)	
11-2-73	-6.5	Pulled 2 Logs From 2nd Bay. 4 Logs at 4th Bay	LSM
		Log caught in 2nd Bay - Pulled 2 Logs From 4th Bay Area.	LSM
11-6		PULLED LOGS 1 BAY HASILLS IN OTHER HALF OUT	MC
11-8		IOU BAYS HAVE 1 LOG IN ONE BAY HASILLS OTHERS 0 L	MC
12-[illegible]	-7.9	OK	LSM
1-4-73	-9.25	OK	LSM
1-[illegible]	-10.9	OK	LSM
1-[illegible]	-2.6	OK	LSM
2-[illegible]	-9.9	OK	LSM
2-[illegible]	-2.5	OK	LSM
5-[illegible]	-8.7	Cleaned 2 Small Logs That were in Low Bay	LSM
	-8.4	[illegible] Logs from Privacy Hook Section [illegible] from Section	
6-1-73	-6.45	PUT IN 3 Logs. All Log IN Nets. Cleaned much Trash + Some Small Logs	LSM
7-1-73	-4.85	Cleared Lots of Big Trash Logs from Log Raft (After) worker at center point dropped out	ROC
7-2	-5.1	PULLED 5 LOGS CLEARED TIMBER (NOT ALL)	MC
7-[illegible]	-5.1	TIMBER [illegible]	MC
7-11-73	-6.6	Large Log in one bay & Raft in another, There is [illegible] A Large Lateral crack the Entire Length of the 1st Section Upstream (The only?)	[illegible]
7-12	-7.1	PUT IN ALL LOGS CLEARED DEBRIS FROM LAPPED LOGS	MC
8-12	-6.7	Cleared Debris + 2.5 over Logs. out Trash Bay Stop Log Boom	LSM
8-21	-6.5	CLEARED DEBRIS-NEW LOGS PULLED-ALL LOGS IN	MC
9-[illegible]	-6.95		LSM
9-[illegible]	-6.85	Pulled 1 Log	LSM
9-[illegible]	-7.0		LSM
10-[illegible]	-7.0	Pulled 2 Logs. Cleaned 1 Log Log + much Debris	LSM
10-17-73	-7.5	2 Bays Spilling PUT TIMBER	[illegible]
[illegible]-1	-6.[illegible]	PULLED 5 LOGS IN	MC
[illegible]	-7.1	Pulled 2 Logs (Boom Logs) from 2nd Bay & from 3rd Bay (Small Logs) Logs to go out Boom Bay	LSM
[illegible]	-9.4	Pulled 4 Logs (Boom Logs) from Boom Bay	LSM
	-8.3	CLEARED OUT DEBRIS	MC
5/15/74	-9.3		LSM
5/15	-9.8		[illegible]

PILE CAP

DATE '74	CENTER PIER	DESCRIPTION	CONT FROM PG	CONT ON PG	SUMMARY ON PG	DATE	
							BJ
	-7.0	Clean & Debris (Cont Pt - Last)					LJM
5-2-74	-5.5	Put in 3 Logs each Low Bay (6 Total)					LJM
5-3-74	-6.5	Put in 4 Logs Now we have 2 Logs out in 4 Bays					LJM
		1 in out in 2 Bays. 5th Bay 2 Logs in					LJM
5-16-74	-6.5	1 Log in 1 Bay; Railroads paint, Lowrods Roofing & Creosote					PM
6-19-74	-6.5	Cleaned Large Log Down Stream of Trash					LJM
6-25-74	-7.0	Put in 4 Logs (All In Now) Put on Locks					
		Recovered Leg Boxes w. Th Roofing Paper					LJM
7-1-74	-6.5	Cleared Trash					SCS
7-10		+6"/ft - Box needs paint & Metal Cover put on					SCS
	-7.2						
-23	-6.9	CLEANED DEBRIS					MS
9-10-74	-7.0	Cleared Debris from Top Section.					LJM
10-4-74	-6.8	Pulled 2 Logs (1 from each center Bay)					LJM
10-6-74	-7.1						LJM
10-14-74	-7.25	CLEARED DEBRIS,					LJM
11-6	-7.1	PULLED 8 LOGS 2 EACH OUTER BAYS ALL OTHER BAYS 1 EACH					SL
11-14-74	-7.3	Pulled 4 Logs (2 each in 2 Bays) 2 Logs Left					
		in Bottom Row - Cover & Locking Devices at Top					
11-19-74	-7.65	Ok					LJM
12-2-74	-7.2	Ok					LJM
1/3/75	-7.1	CLEANED DEBRIS (BRANCHES DEAD WOOD					MS
1/17	-7.6						MS
1-24-75	-7.2						LJM
2-3-75	-7.2						LJM
2-25	-7.3						LJM
3-7-75	-7.3	Put in 6 Logs (Each Low Bay) 1 Row out + 2 out in					
		Low Boxes.					LJM
3-14-75	-7.25	Put in 2 Logs All In Now. Cleaned Trash					LJM
3-19-75	-7.1						LJM
4-1-75	-7.6	Check inside walk needs Epoxy Coating					PM
4-2	-7.2						PM
4-11-75		3½-4" over logs					KJZ
4-15-75	-6.9	+0.05 over All Logs. Clean Trash + Logs from					
		Stop Section + Railing needs Paint					LJM
4-15		Rail Needs Painting					LJM
4-25-75	-6.95	Painted Railing + Cut Brush + Picked up					LJM
4-30-75	-6	Cut 5½" from Pier					KJZ
5-7-75	-5.95	Cleaned					LJM
5-14-75	-6.6	Put 4 Logs of 2 Bays Steel (4 Logs in 2 Center Bays)					LJM
5-22-75	-7.2	Pulled 2 Logs Cleaned Debris from Section					LJM

NEW HAMPSHIRE WATER RESOURCES BOARD CONCORD N. H.

PROJECT Dequaket — -7.05' is full Lk

FILE

SUBJECT

ACC

COMPUTER CHECKER CONT. FROM ACC. CONT. ON ACC. SUMMARY ON ACC. DATE

Date	Center Pier		By
12-2-75		Pulled 3 Logs Only 1 Log in each Center bay	SCB
2-20-76	-9.6	Area OK.	LTM
3-25-76	-7.42	2 Logs caught on center	LJM
4-1-76	-7.5	Cleaned 1 Log at Stop Bay + 1 To Go.	LJM
4-15-76	-8.7	INSTALLED 8 STOP LOGS IN ONE BAY (EVEN W/OTHER BAYS) REMOVED CAUGHT TREE LOG - ALL CLEAR NOW ONE BAY STILL EMPTY OF STOP LOGS. HINGE ON STORAGE HOUSE DOOR LOOSE FROM TOP OF BOX	GLK
5-3-76	-8.2	Put in 9 logs.	PDK
5-6-76	-7.0	Rec. After Logs + Tamped Logs To Seat + Seal Leaks. M.R. bay Log Elev. is -7.0/2 cond bays are 1 Log high.	LJM
5-14-76	-6.1		PDK
5-18-76	-6.05	1 Lg. Log in one Bay & 2 long Logs in 2 Bays	PDK
5-21-76	-5.8		PDK
6-18-76		C. Crew took new S.L. Box up & Removed old one & Removed Lg log from S.L. Bay	P.D.K
7-8-76	-6.75		SCB
7-6-76	-6.70	Clear STUMP + debris, (all logs in, Flowing. IN MIDDLE BAYS	SF RFF
8-10-76	-6.3	Removed 2 Logs (CENTER PART) (ALL WAS EVEN ACROSS BAYS)	GLK
9-2-76	-6.3		PDK
9-7-76		After C.C. Some debris AT LOGS (small)	RFF
9-14-76	-6.7		P.D.K
10-8-76	-6.6	Little debris in log Section!	TCFF
11-1-76	-6.2'	Pulled Slogs.	LM/JM
10-27-76	-6.2		
11-12-76	-7.4	Pulled 3 Logs (2 top Strings now out) (2 Logs ± To Go in 2 Deep bays) (Top Log in Bay 2 Cond Bay)	LJM
1977			
1-14-76	-8.7		LJM
3-4-77	-8.9	Area OK	LJM
4-22-77	-7.8	Clear Some debris, Also Replaced 4 Logs	RFF
4-29-77	-7.5	Put in 9 Logs (2 Logs out) Covered Sheet of Plywood	LJM

-7.00 is full lake

PEQUAKET

REMARKS

DATE	Center Pier	REMARKS	BY
[illegible]	[illegible]		[illegible]
5-25-77	-6.95	Put in Last 2 Logs (ALL IN) Cleared big Log at Stop Section	LJm
6-10-77	-7.60	Clear little debris - O.K.	[illegible]
6-29-77	-7.70	" " " O.K.	[illegible]
7-8-77	-7.90	" " "	[illegible]
[illegible]	-8.1		PDK
8-29-77	-6.9	cleared Switch	LJm
10-4-77	-6.1	Pulled 2 Logs	LJm
10-13-77	-6.30	Pull 1-log (3-out total) Clean out logs — Clear -	[illegible]
10-17-77	-5.50	Pull 7-logs 12 out total = 3 out ea. Bay	[illegible]
10-31-77	-4.5	Pulled 3 Logs 2 out across + 1 Left in bottom of each mid bay Winter Operation	LJm
[illegible]	[illegible]	Clear -	[illegible]
1978			
[illegible]	-7.3	ice over	[illegible]
4-7-78	-8.3	Clear - - Water (Rivers) [illegible] Moderate	[illegible]
4-15-78	7.2	CLEAR	KJS
5-3-78		Place 4 Logs [illegible] in Bay each side of Center Pier.	[illegible]
[illegible]	-7.6	Put in 12 Logs (2 more Logs To Go) Cleared Switch	LJm
[illegible]	-6.0	Remove large log + debris, O.K. Replace 4-? 2 [illegible]	[illegible]
[illegible]	?6.?	cleared 2 Logs + Large Rock. Still a Telephone pole + 4 Logs To Go	LJm
6-19-78	-6.5	much debris caught in stop [illegible]	[illegible]
[illegible]	-6.10	Remove much debris (Large logs) also downstream [illegible] To Prevent Clogging of future debris (Also 2-logs)	[illegible]
[illegible]		+0.20 logs Clear debris + Paint RAIL - POST [illegible]	[illegible]
[illegible]	[illegible]	Pulled 1 Log To [illegible]	[illegible]
[illegible]	7.35	Removed Log [illegible] much Trash From Stop Section	[illegible]
[illegible]	-7.4	cleared Trash in Stops	[illegible]
[illegible]	-7.5	" "	LJm
10-?-78	-7.4	Pulled 8 logs (? out total) [illegible]	[illegible]
[illegible]	-?.?	Pulled ? Logs [illegible]	[illegible]
11-?-78	-6.??	[illegible] O.K.	[illegible]
[illegible]	[illegible]	[illegible] Cleaned [illegible]	[illegible]

PEG MARKET

FILE

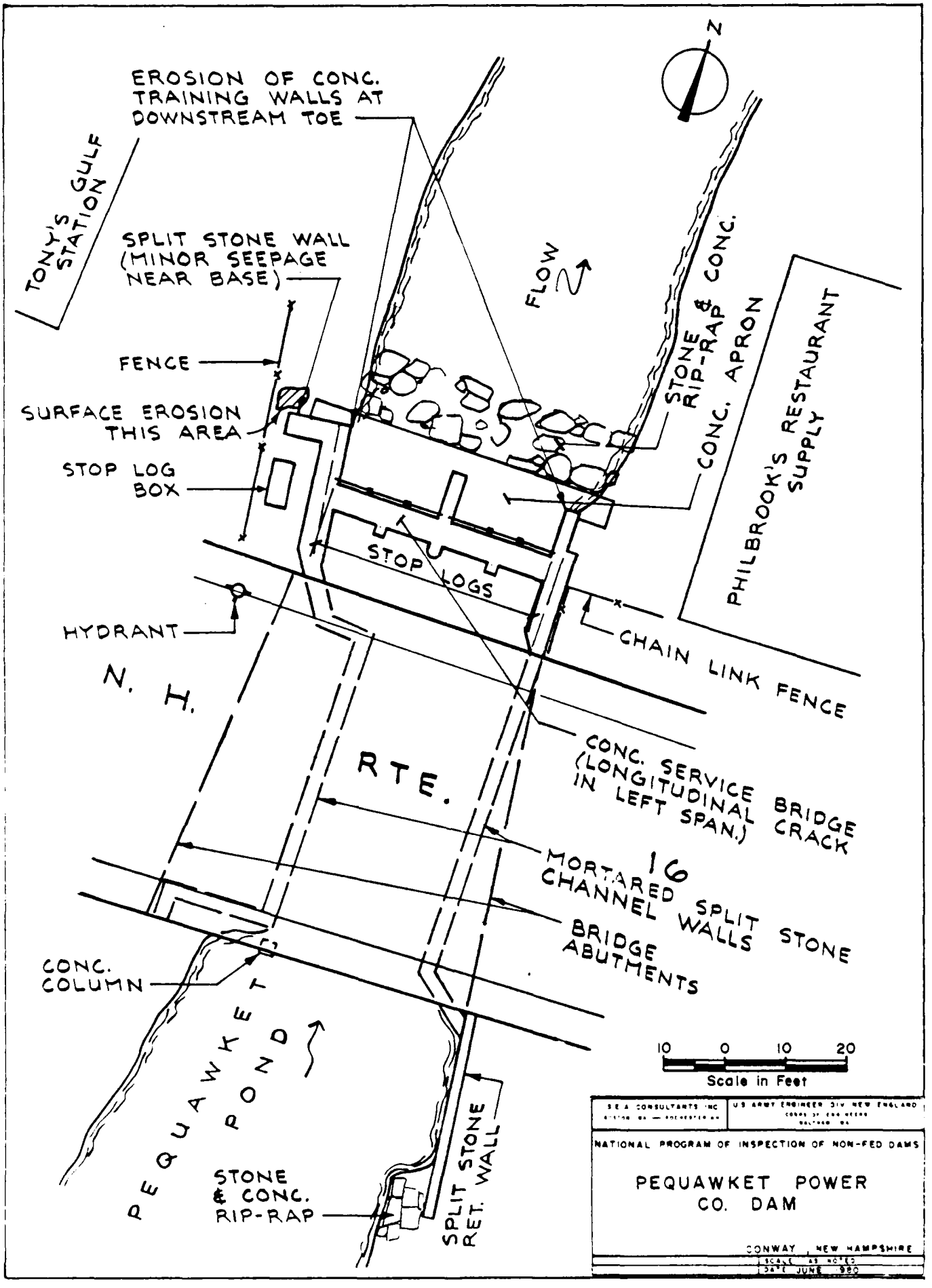
ACC.

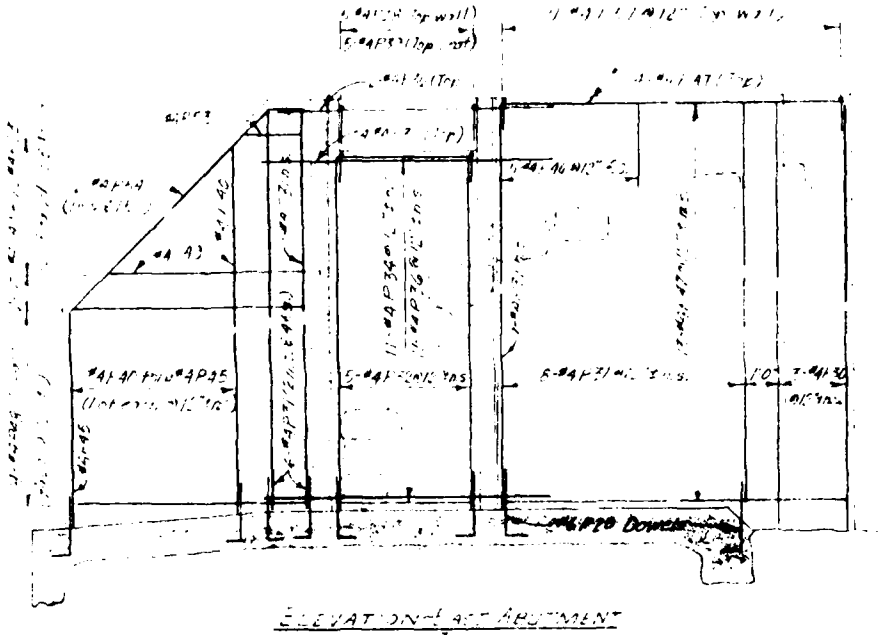
DATE

REMARKS

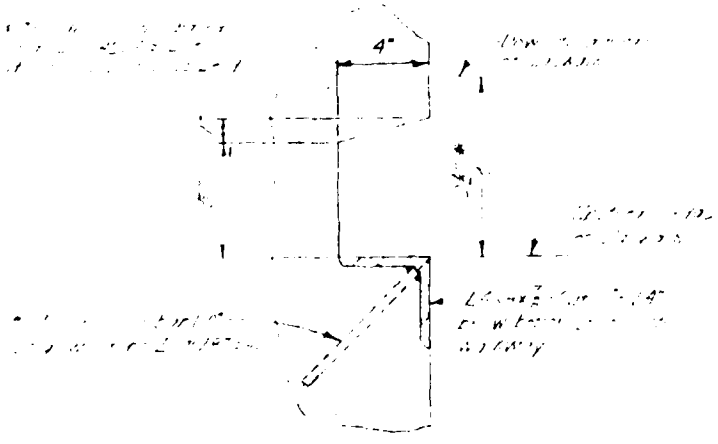
DATE	CUM. DEF.	REMARKS	BY
3-5-79	-2.3	CLEAN OK	
5-2-79	-2.5	Skinned Logs - Built From bays OUT	
		TO 10 Logs (Each bay) 2 Logs LEFT	
		OUT NEXT LAST FF	
5-17-79	-6.65	REPLACE LAST 2-LOG'S (ALL-IN)	
5-[illegible]		+1.75 [illegible] - Removed debris Log area-OK	GG
6-[illegible]	-6.4	All debris in and out, small amount debris on logs water. Some in bays on B/S and Step	GLK
8-18-79	-6.5		GLK
8-20-79	-6.8	Cleaned garbage and debris from Steps, bays-all OK	GG
9-11-79	-6.88	Clear & Much Glass - Litter on Top.	
9-[illegible]-79	-6.9	Litter, Cobble Rte. on Steps and Area Surrounding	GG
10-[illegible]-79	-6.6	6 of 3-Logs Short of Design Set Bay [illegible]	
10-[illegible]-79		~~[illegible]~~ Pulled 3 Logs (12 Logs out Total)	KS
		2 Bays have 4 Logs out and 4 Bays have 1 Log out	
11-[illegible]	-2.5	[illegible] 9 Logs - All - KS Inventory of 4 Bays, Count	
12-[illegible]	-2.5	Pull 10 Logs (with helper assist) 2 Logs 1-22, 2 Bays	
		2-24, End Bays 6-26 Also Fill Stairwell	
3-[illegible]-80	-10.0	Put in 10 Logs to get (4 Logs in 4 Low bays)	
3-25-80	-8.[illegible]	Replaced 8 Logs, Got to = 8 Full Logs.	
		Also Note, Some drain from Site (Old Soil Testing	
4-[illegible]-80	-7.05	Put in 4 Step Logs. Three Logs were full of	PDK
		debris and Logs. Logs could be pulled out	
4-[illegible]-80	-6.00	Pull 5 Logs Remove Large Log From In Front.	
5-1-80	-7.5	Replaced 17 Logs - Next Bays up to Full @ 6, 3 Right	PDK
		Bays need 1 Log and 1 Bay need 2 Logs. 4 Logs used	GLK
		to be made Lengths 5'-10" Howard, IT	
		-6.5 is Full Pond. Then Three are Four Logs	
		The Last Bays Used to be Lowered by 1 Steps and	
		One Station Needs 1 Log, Inside the Two Rear Low	
5-[illegible]-80	-6.50	Remaining Logs, Full 2 Ex Logs. Fall-In. Removed	

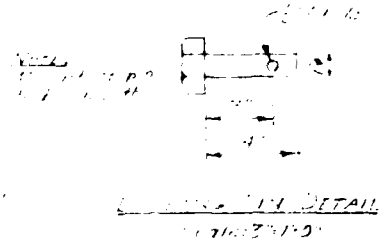
PLANS AND DETAILS

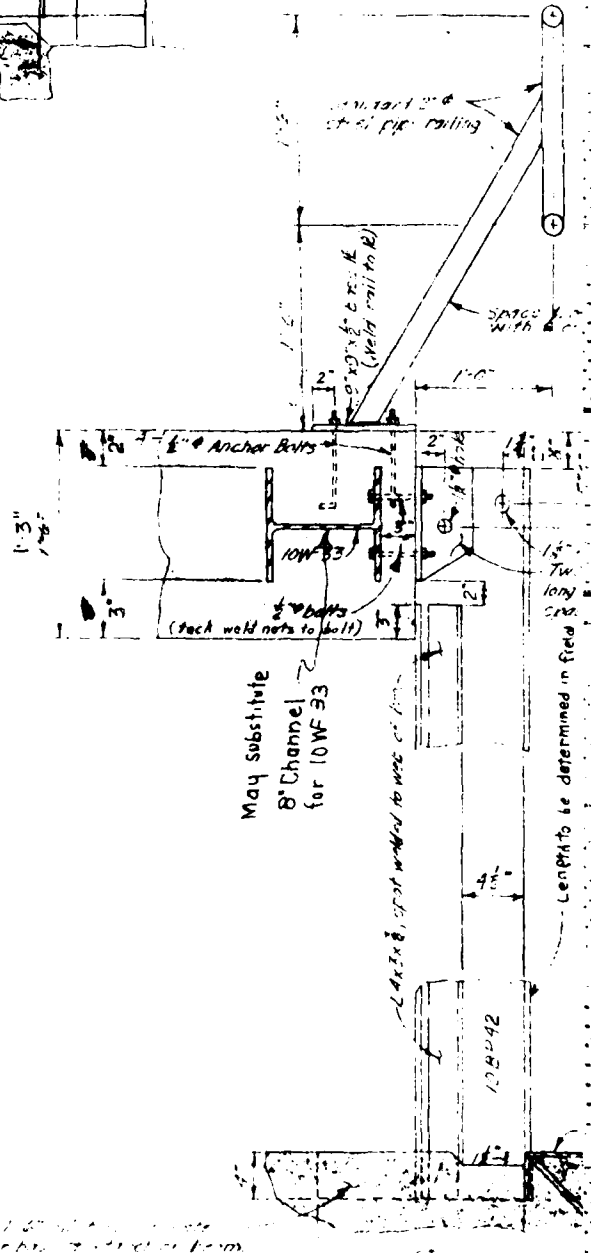

N
EROSION OF CONC. TRAINING WALLS AT DOWNSTREAM TOE
TONY'S GULF STATION
SPLIT STONE WALL (MINOR SEEPAGE NEAR BASE)
FLOW
STONE RIP-RAP & CONC. APRON
PHILBROOK'S RESTAURANT SUPPLY
FENCE
SURFACE EROSION THIS AREA
STOP LOG BOX
STOP LOGS
HYDRANT
CHAIN LINK FENCE
N. H.
RTE.
16
CONC. SERVICE BRIDGE (LONGITUDINAL CRACK IN LEFT SPAN.)
MORTARED SPLIT STONE CHANNEL WALLS
BRIDGE ABUTMENTS
CONC. COLUMN
PEQUAWKET POND
STONE & CONC. RIP-RAP
SPLIT STONE RET. WALL
10 0 10 20
Scale in Feet
S E A CONSULTANTS INC
U S ARMY ENGINEER DIV NEW ENGLAND
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
PEQUAWKET POWER CO. DAM
CONWAY, NEW HAMPSHIRE
SCALE AS NOTED
DATE JUNE 980



ELEVATION—EAST ABUTMENT

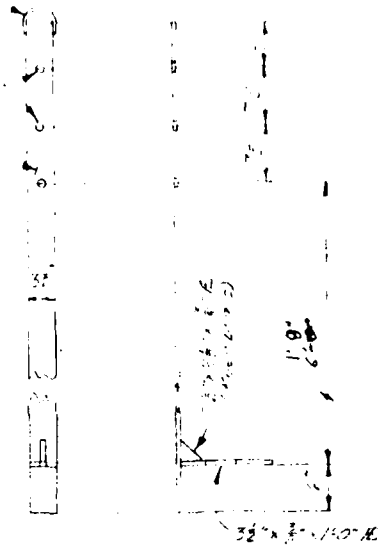




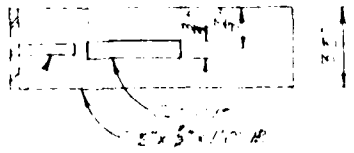


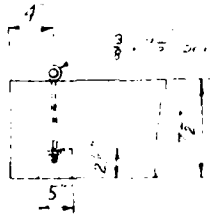
TYPICAL STANCHION BEAM
Scale: 1½"=1'-0"

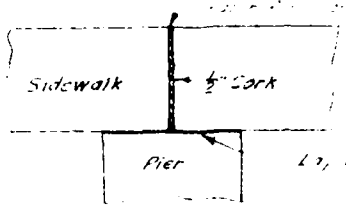
Designed by E.N. LARSEN
Drawn by E.N. LARSEN
Traced by
Checked by R. Lundgaard

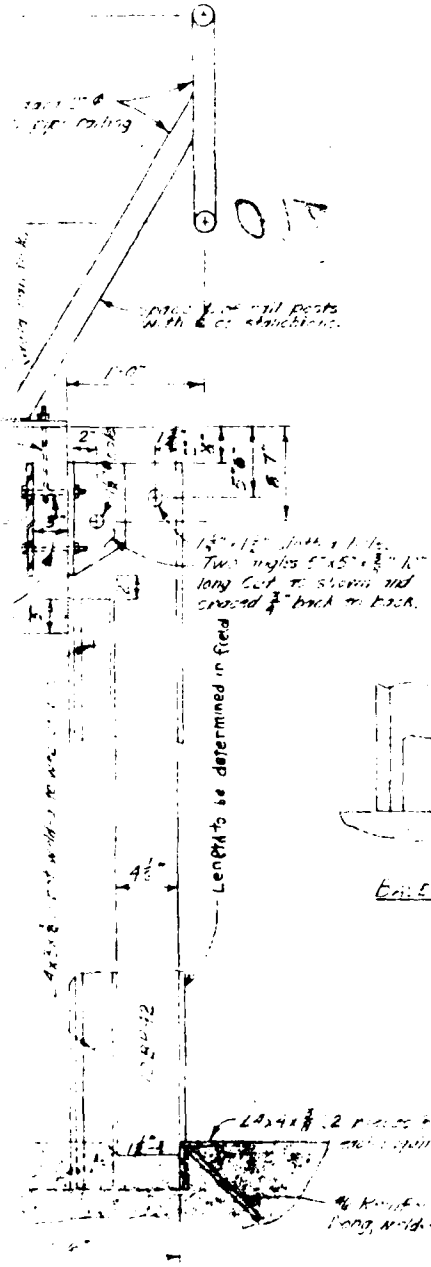


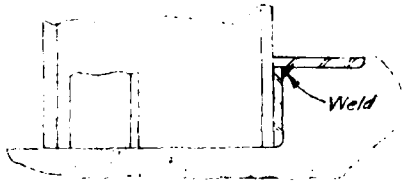
STOPLOG LOCKING LEVER
Scale 1"=1'-0"



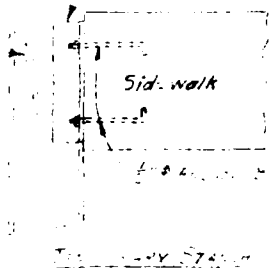








ENDS OF STANCHION BEAM
Scale 1½"=1'-0"



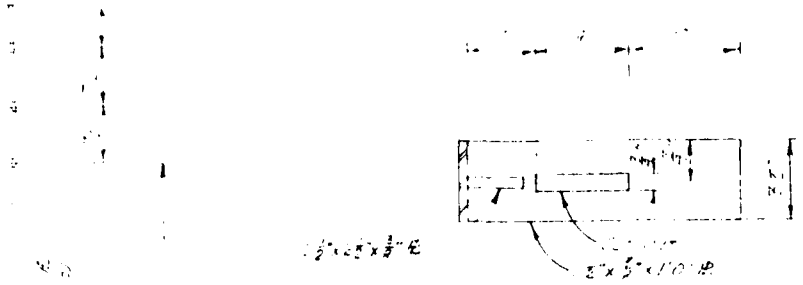
NOTE:

L STANCHION BEAM
Scale 1½"=1'-0"

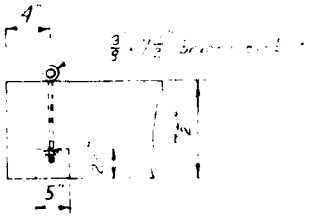
ALSO FROM
DEQUAWKET
CONWAY, NEW
REINFORCING STEEL

NEW HAMPSHIRE WAT
- CONCO

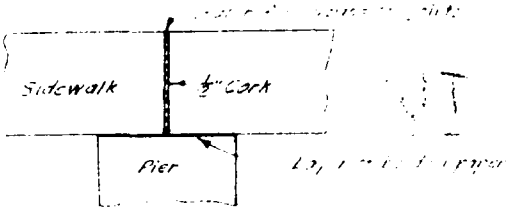
Sheet



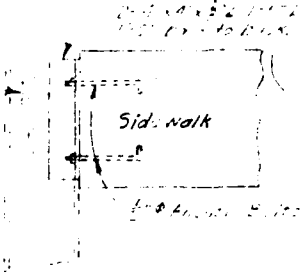
HORIZONTAL ANGLE DETAIL



TYPICAL SPACING DETAIL



SIDEWALK JOINT DETAIL



TEMPORARY STAIRWAY SUPPORT

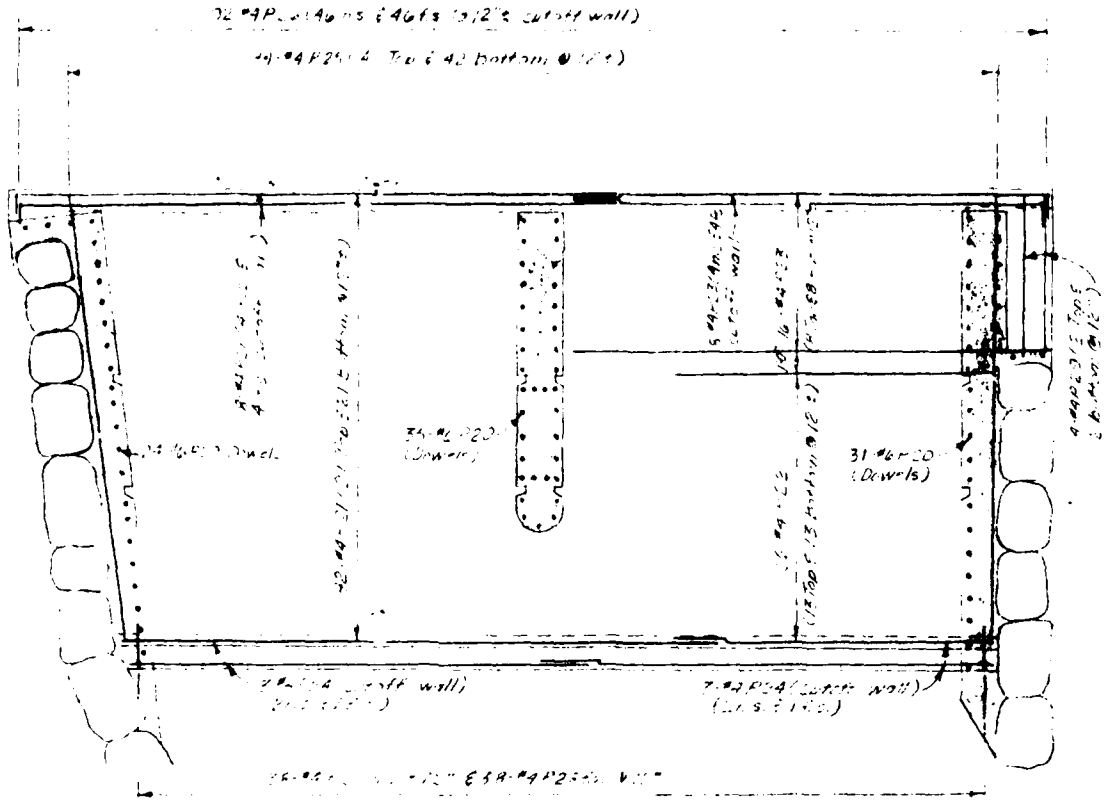
52.02

ALSO HORN POND DAM
PEQUAWKET POND DAM
CONWAY, NEW HAMPSHIRE

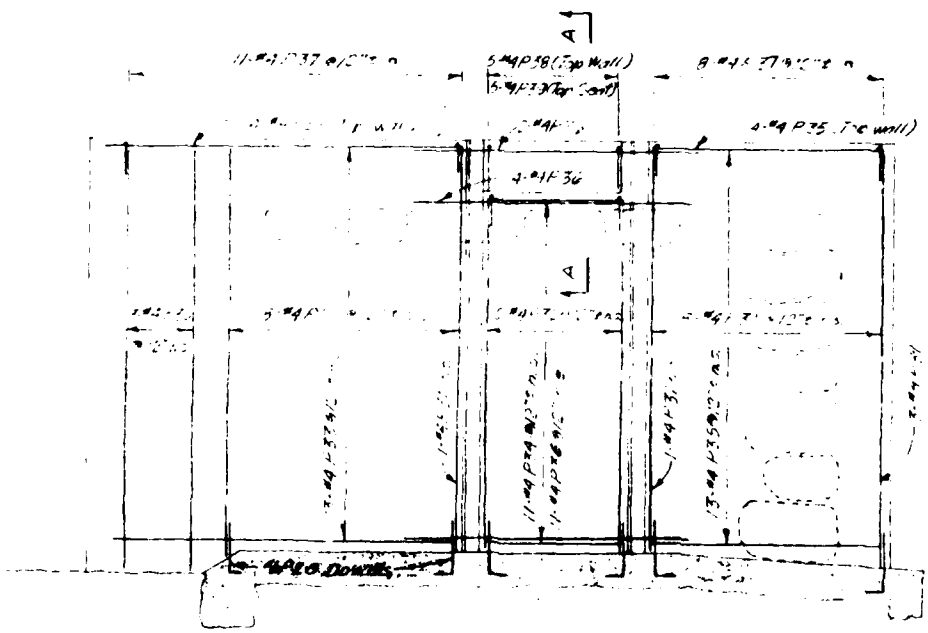
REINFORCING STEEL & DETAILS

NEW HAMPSHIRE WATER RESOURCES BOARD
- CONCORD, N. H. -

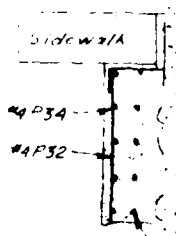
Sheet scale: As Noted	Sheet 3 of 3	Oct. 1969



PLAN
Scale: 1/4"=1'-0"



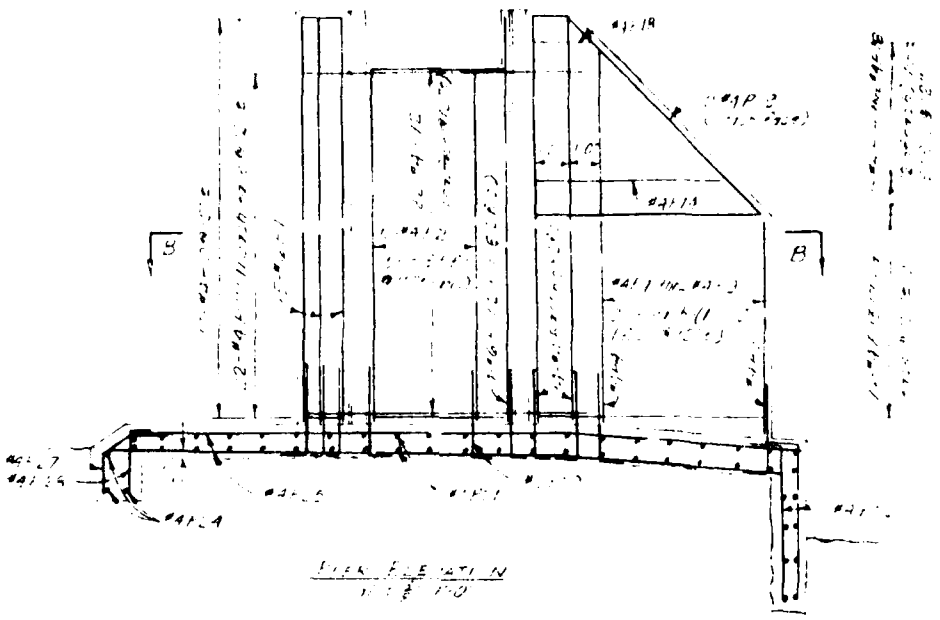
ELEVATION WEST ABUTMENT
Scale: 3/8"=1'-0"



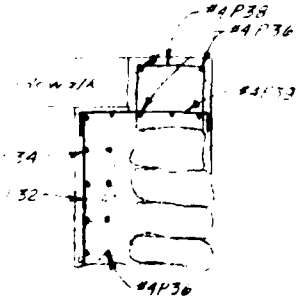
SECTI
Scale

Designed by [illegible]
Drawn by [illegible]
Traced by —
Checked by R. Livingston

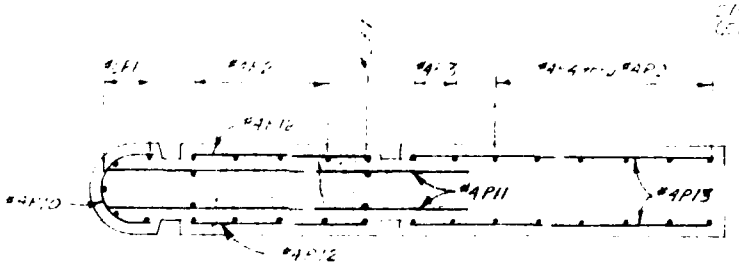
Reinforc
Reinforc
ROCK, Illi
Mississ



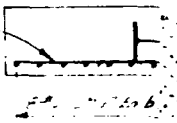
STEM ELEVATION
1/4" = 1'-0"



SECTION A-A
Scale: 3/8" = 1'-0"



SECTION B-B
Scale: 1/4" = 1'-0"



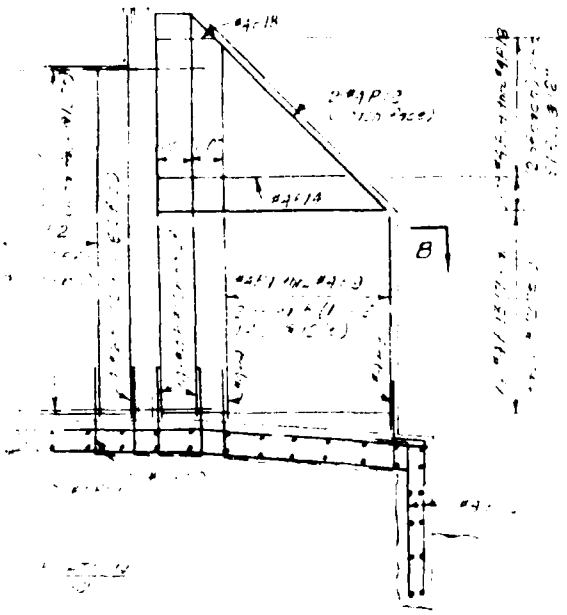
STEEL BACK SE

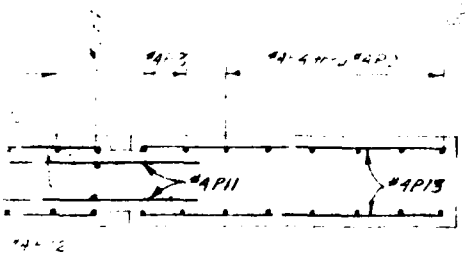
Reinforcing Steel
Reinforcing steel shall be 3" clear unless shown otherwise.
#4 Anchors @ 2'-0" c.c. both ways in bent stem.
Minimum size of all reinforcing bars #4 unless shown.

PEQUAWKET POND
OVERWAY, NEW HAMPSHIRE
REINFORCING STEEL

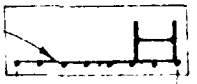
NEW HAMPSHIRE WATER RESO
- CONCORD, N. H.

Sheet 2 of 3





SECTION B-B



SILL RACK SECTION

4.7.02

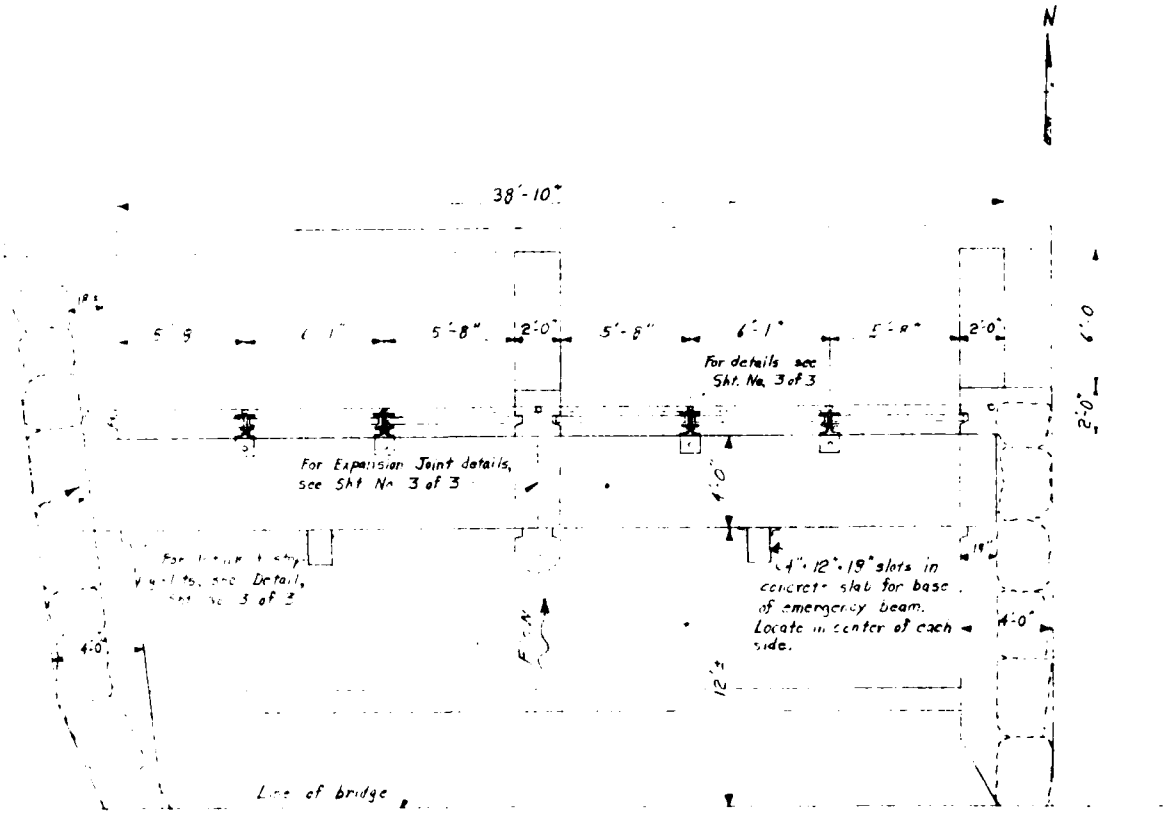
PEQUAWKET POND DAM

CONWAY, NEW HAMPSHIRE

REINFORCING STEEL

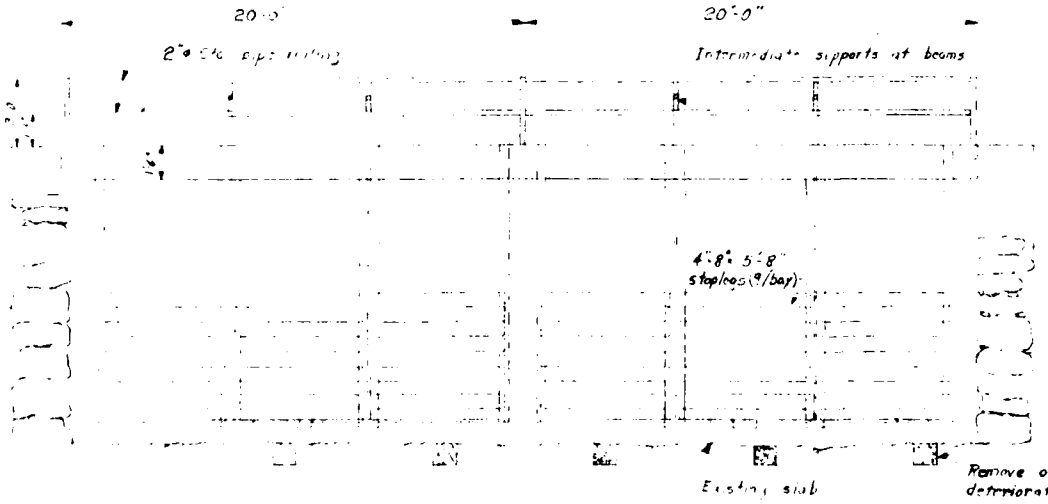
NEW HAMPSHIRE WATER RESOURCES BOARD
- CONCORD, N. H. -

Sheet scale: As Noted	Sheet 2 of 3	Oct 1969



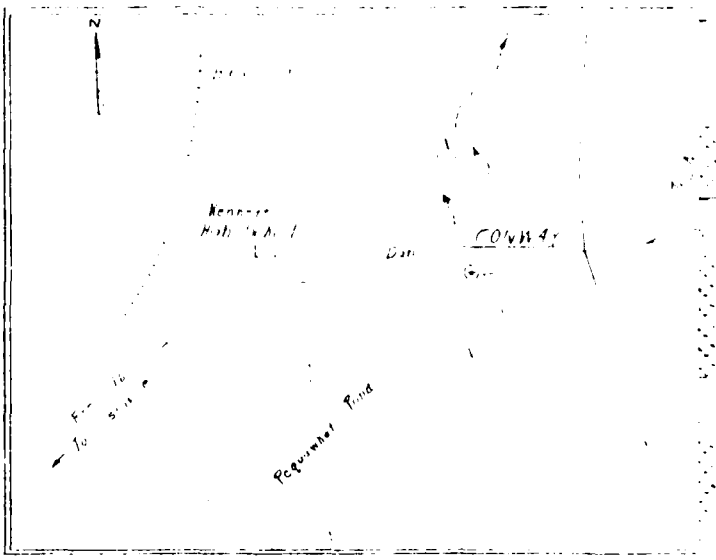
PLAN OF DAM
Scale: 1/4" = 1'-0"

NOTE: Assume crest of old dam to Elevation 100.00 and use this as reference.

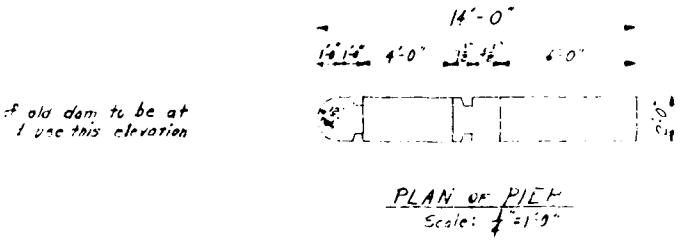


ELEVATION OF DAM
Scale: 1/4" = 1'-0"

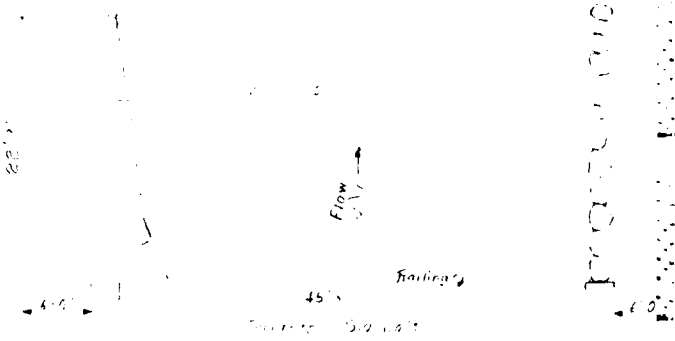
Designed by
Drawn by
Traced by
Checked by E. Ramos



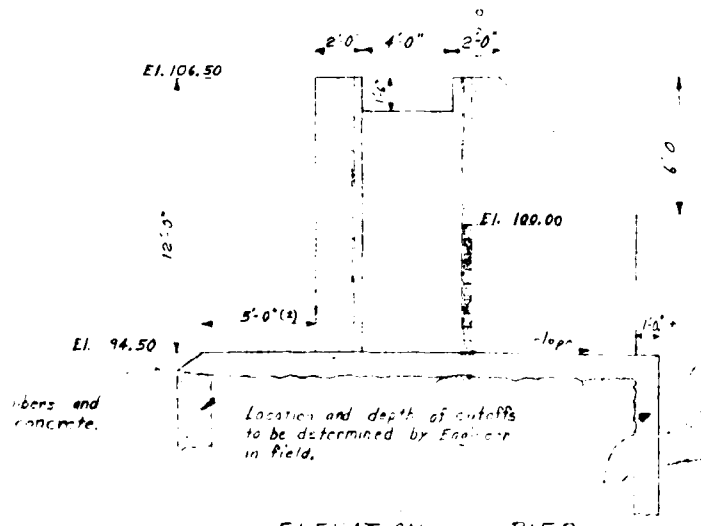
SITE LOCATION
Scale: 1" = 500'



PLAN OF PIER
Scale: 1/4" = 1'-0"



PLAN OF PROPERTY LINE



ELEVATION OF PIER
Scale: 1/4" = 1'-0"

NOTE: ELEVATIONS REFER TO NEW HAMPSHIRE WATER RESOURCES BOARD DATUM, TOP OF FLASHBOARD ELEVATION = 100.00. TO CONVERT TO ASSUMED NGVD (USGS QUAD SHEET NORMAL POOL ELEVATION = 458) ADD 358.0 TO ALL ELEVATIONS THIS SHEET.

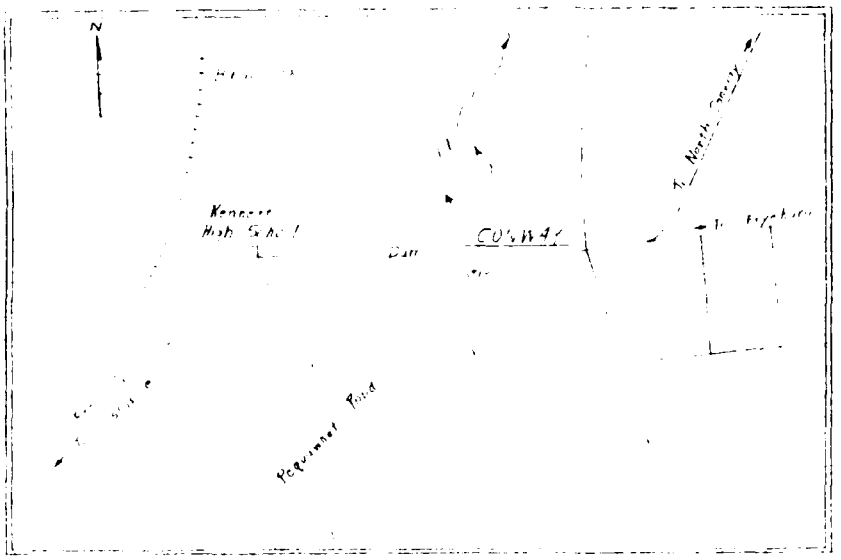
SEA CONSULTANTS INC.
US ARMY CORP
JUNE 1980

PEQUAWKET POND
Conway, New Hampshire
GENERAL PLANS & ELEV.

NEW HAMPSHIRE WATER RESO
- CONCORD, N. H

Scale: as noted

Sheet No. 1 of 3



SITE LOCATION
Scale: 1" = 500'

NOTE: ELEVATIONS REFER TO NEW HAMPSHIRE WATER RESOURCES BOARD DATUM, 0.0 OF FLASHBOARD ELEVATION = 430.00. TO CONVERT TO ASSUMED NGVD (USGS QUAD SHEET NORMAL POOL ELEVATION = 458) ADD 358.0 TO ALL ELEVATIONS THIS SHEET.

SEA CONSULTANTS INC.
US ARMY COPP JUNE 1980

PEQUAWKET POND DAM
Conway, New Hampshire

GENERAL PLANS & ELEVATIONS

NEW HAMPSHIRE WATER RESOURCES BOARD
- CONCORD, N. H. -

Scale: as noted	Sheet No. 1 of 3	Date: 9/26/79

APPENDIX C

SELECTED PHOTOGRAPHS

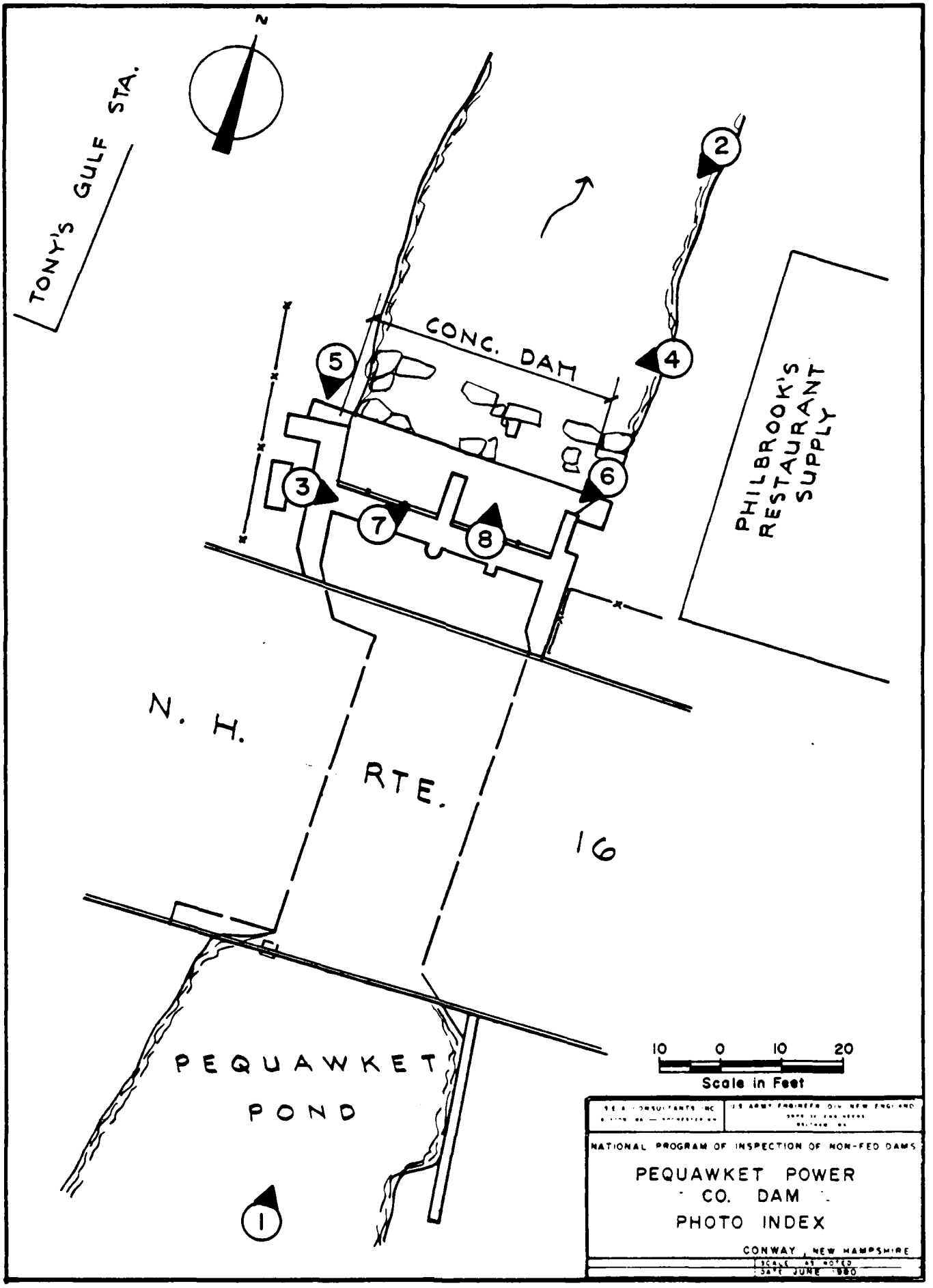

N
TONY'S GULF STA.
CONC. DAM
PHILBROOK'S RESTAURANT SUPPLY
N. H. RTE. 16
PEQUAWKET POND
1
2
3
4
5
6
7
8
10 0 10 20
Scale in Feet
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
PEQUAWKET POWER CO. DAM
PHOTO INDEX
CONWAY, NEW HAMPSHIRE
SCALE AS NOTED
SEPT JUNE 1980

Photo No. 1 - Main Street Bridge and approach channel to dam

Photo No. 2 - General view of downstream face of dam

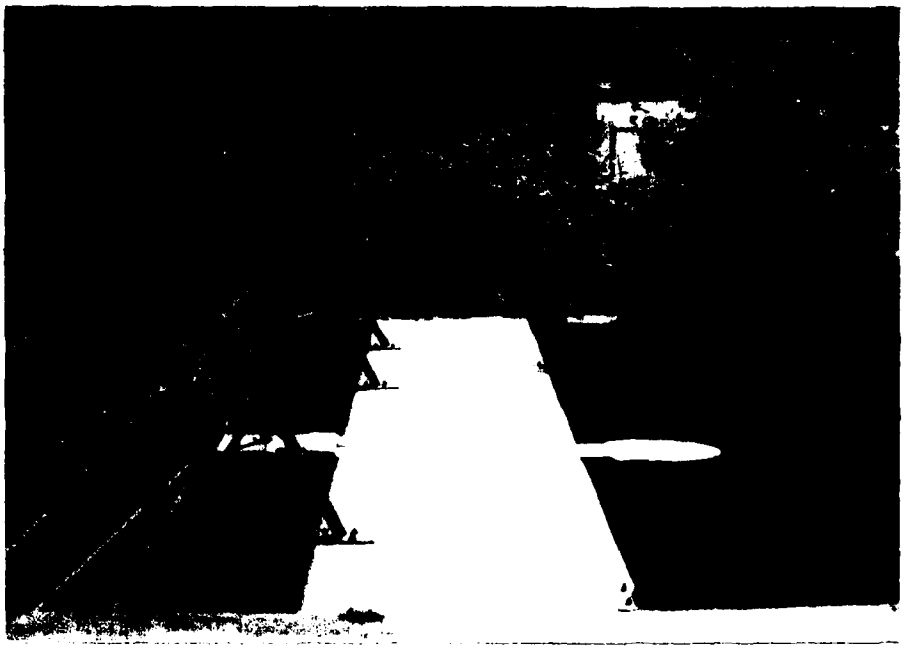


Photo No. 3 - View of crest of dam and right abutment from left abutment

Photo No. 4 - View of downstream face of left abutment

Photo No. 5 - Closeup of leakage between left training wall and left abutment

Photo No. 6 - Closeup of cracking at [illegible] of right training wall

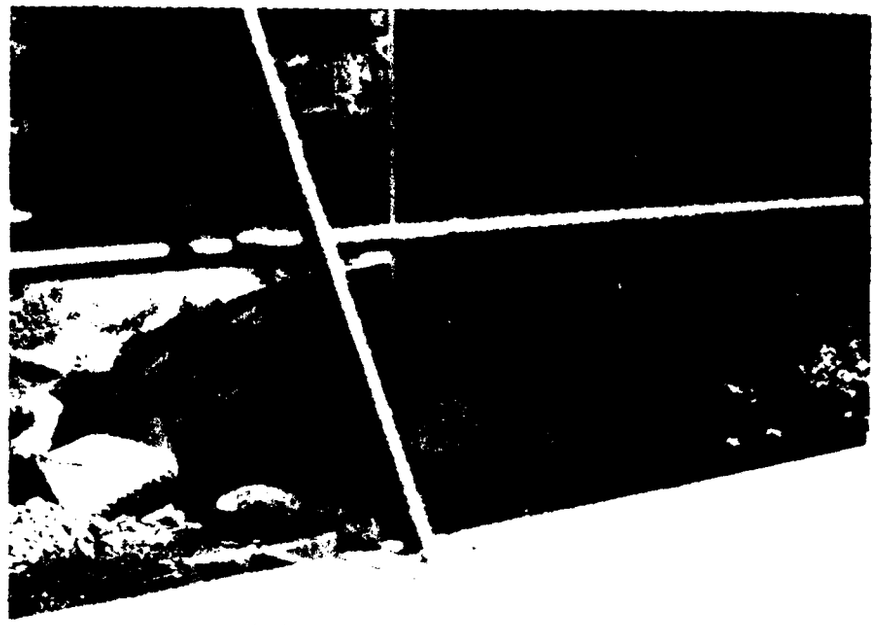
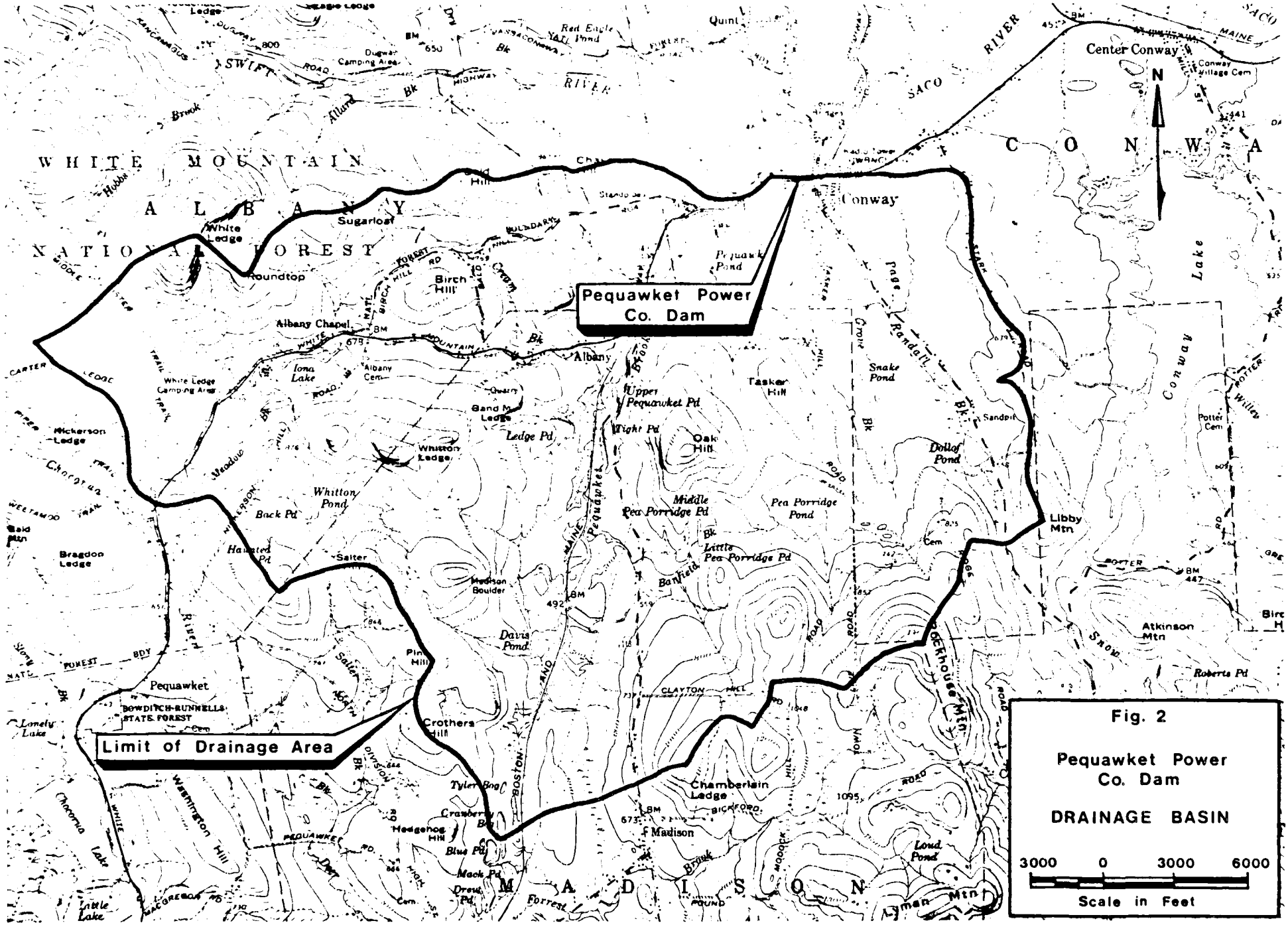


Photo No. 7 - Building immediately downstream of right abutment

Photo No. 8 - General view of downstream channel from service bridge

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS


Pequawket Power Co. Dam
Limit of Drainage Area
Fig. 2
Pequawket Power Co. Dam
DRAINAGE BASIN
3000 0 3000 6000
Scale in Feet
N
WHITE MOUNTAIN NATIONAL FOREST
ALBANY
CONWAY
MADISON
Center Conway
Conway
Albany
Pequawket
Sugarloaf
Roundtop
Birch Hill
Albany Chapel
Iona Lake
Whitton Pond
Back Pd
Ledge Pd
Upper Pequawket Pd
Tight Pd
Oak Hill
Tasker Hill
Snake Pond
Middle Pea Porridge Pd
Pea Porridge Pond
Little Pea Porridge Pd
Davis Pond
Crothers Hill
Chamberlain Ledge
Madison
Libby Mtn
Atkinson Mtn
Lyman Mtn
Loud Pond
Conway Lake
Saco River
Swift River
Pequawket Pond
Dollof Pond
Bowditch-Bunnells State Forest

I. Basic Data

A. Drainage Area

1. 27.2 square miles — as defined on U.S.G.S. sheet and then planimetered

2. drainage area would classify as mountainous, however there are numerous ponds and swampy areas upstream from the dam

B. Dam and Storage Information

1. Size Classification: INTERMEDIATE based on storage (≥1000 acre-feet and < 50,000 acre-feet)

   as indicated below storage at crest of dam estimated to be 1,880 acre-feet

2. Hazard Potential: Significant

3. Storage Information

Descriptive Information	Elevation (feet)	Surface Area (acres)	Storage (acre-ft)
480' contour	480	675	
Top of dam	464.5	335	1,990
460' contour	460	202	635
Normal pool	≈ 459	143	390
Spillway crest	457.3	122	295

* Notes : (1) elevations : NGVD
(2) Normal pool taken to correspond with pool shown on U.S.G.S. sheet, elevation of top of stoplogs 457.3'
(3) Surface area at top of dam determined by interpolating between the surface areas defined by the pool shown on the USGS sheet and the 460 feet and 450 feet contours
(4) Storage at crest of stoplogs estimated by dividing surface area into pyramidal frustrum sections and determining the volume of each section with the equation for the volume of a pyramidal frustrum

C. Spillway Information

1. Concrete stoplog spillway with six stoplog bays located in center of dam.

2. discharge over spillway given by Sharp-crested weir formula up to elevation 463.0 feet

$$Q = CL H^{3/2}$$ (Standard handbook for CEs, Merritt)

where : Q = discharge, cfs
L = weir length, feet
H = head over weir, feet
C = discharge coeff

$$C = 3.27 + 0.4 \frac{H}{P}$$

where H is [illegible] above
and P = [illegible] weir
above [illegible]

3. above elevation 463.0 feet (bottom of service bridge) stoplog bay openings will essentially function as orifices, therefore the orifice discharge formula would be applicable

$$Q = C a \sqrt{2 g h}$$ (Standard Handbook for CE's Manual)

where: Q = discharge, cfs
C = orifice coef., use 0.6
a = area of orifice, ft²
g = acceleration due to gravity, ft/s²
h = head above horizontal centerline of orifice, feet

II Estimate Effect of Surcharge Storage on Maximum Probable Discharge

A. Develop stage-discharge curve for outflow from dam complex

1. define sources of outflow

a. discharge over spillway — assume stoplogs set at approx 457.3 ("typical" stoplog arrangement

(1) discharge to elevation 463 defined by broad-crested weir formula as defined above

(2) discharge above elevation 463' defined by orifice discharge equation for stoplog openings

(3) discharge over crown of right ice sluice above elevation 464.5' defined by broad-crested weir equation

$$Q = C L H^{3/2} \text{ with } C = 2.8$$

b. discharge over training walls and roadway above elevation 464.5' defined by broad-crested weir equation with C = 2.6

2. Discharge over spillway

a. Weir discharge

Elevation (feet NGVD)	C	L (feet)	H (feet)	Q (cfs)
457.3	—	—	0	0
458	3.29	30.8	0.7	60
459	3.40	↓	1.7	230
460	3.47		2.7	470
461	3.55		3.7	730
462	3.62		4.7	1140
463	3.70		5.7	1550

b Orifice discharge

Elevation (feet, NGVD)	C	a (feet²)	h (feet)	Q (cfs)
464	0.6	≈ 176	3.9	1,670
465	↓	↓	4.9	1,980
466			5.9	2,060
467			6.9	2,230
469			7.9	2,390
469			8.9	2,530
470			9.9	2,670

3. Discharge over service bridge

Elevation (feet NGVD)	C	L (feet)	H (feet)	Q (cfs)
464.5	2.8	≈ 37	0	—
465	↓	↓	0.5	40
466			1.5	170

3. Service bridge discharge – CONTINUED

Elevation (feet NGVD)	C	L	H	Q
467	2.8	≈ 37	2.5	410
468	↓	↓	3.5	690
469	↓	↓	4.5	990
470	↓	↓	5.5	1340

4. Discharge over left training wall and abutment

Elevation (feet NGVD)	C	Effective L (feet)	Avg H (feet)	Q cfs
464.5	2.6	—	0	0
465	↓	20	0.25	7
466	↓	90	0.75	150
467	↓	290	1.25	1050
468	↓	490	1.75	2950
469	↓	690	2.25	6,350
470	↓	890	2.75	10,600

5. Discharge over right training wall and abutment

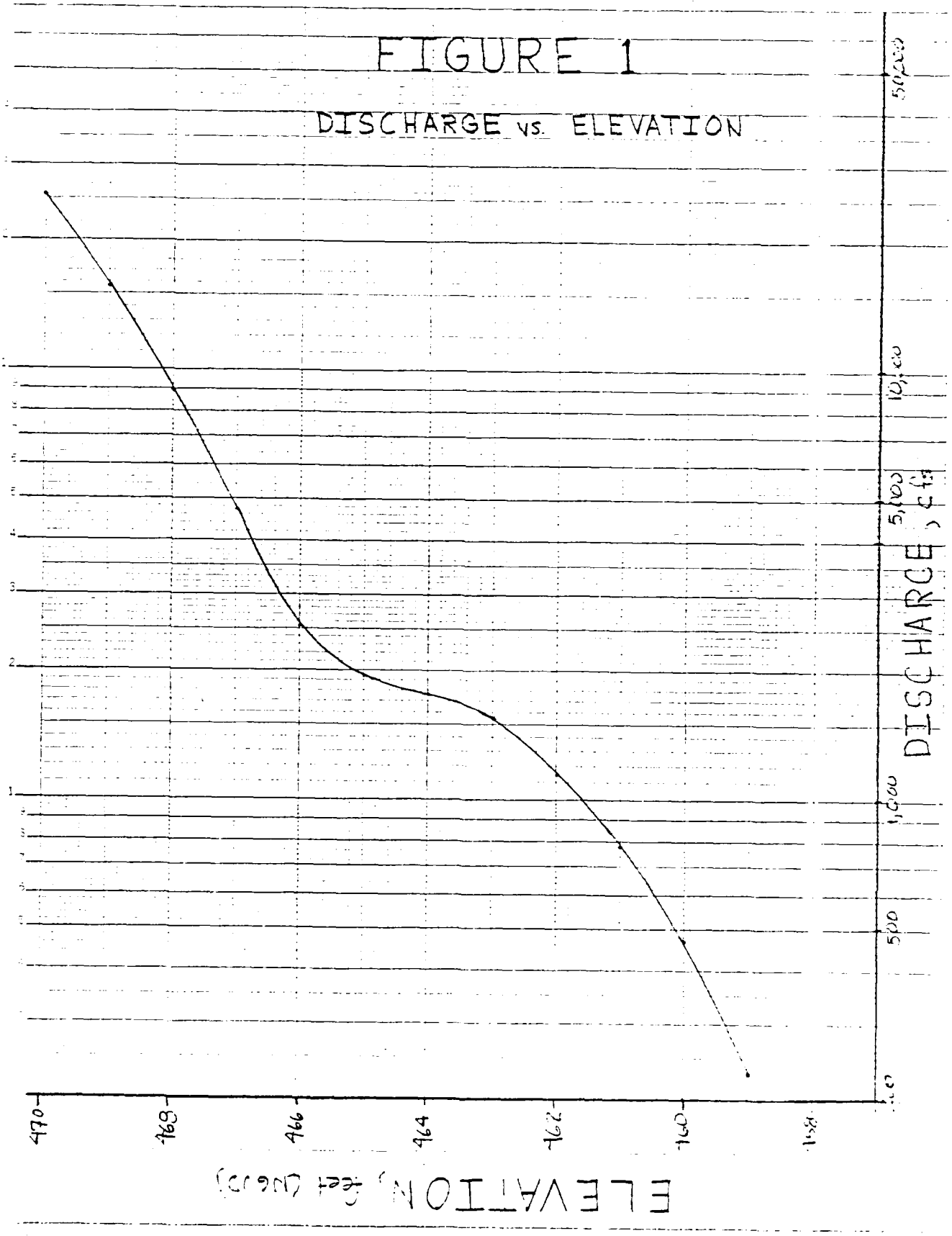
Elevation (feet NGVD)	C	Effective L (feet)	Avg H (feet)	Q cfs
464.5	2.6	—	0	0
465	↓	10	0.25	3
466	↓	90	0.75	30
467	↓	235	1.25	1080
468	↓	490	1.75	2950
469	↓	695	2.25	6,300
470	↓	900	2.75	10,700

6. Total Discharge from project site

Elevation (feet NGVD)	Q Spillway	Q Service outlet	Q left about	Q right about	Q TOTAL
457.3	0	0	0	0	0
458	60	↑	↑	↑	60
459	230				230
460	470				470
461	790				790
462	1,140				1,140
463	1,550	↓	↓	↓	1,550
464	1,670	0	0	0	1,670
465	1,980	40	7	3	2,030
466	2,060	90	150	30	2,330
467	2,230	410	1,050	1,030	4,720
468	2,380	690	2,950	2,950	8,960
469	2,530	990	6,050	6,100	15,670
470	2,670	1,340	10,300	10,700	25,010

FIGURE 1

DISCHARGE vs. ELEVATION



B. Effect of surcharge storage on max. prob. discharge

1. Pertinent Data

 a. Drainage area = 27.2 square miles
 b. Characteristics of basin - mountainous, however use rolling curve to estimate MPF Peak Flow Rate due to numerous lakes and swampy areas located in upper part of basin
 c. Test flood = 1/2 PMF
 d. Follow Army Corps' procedure

2. STEP 1: Determine Peak Inflow Q_{P1} from Guide Curve

 a. the maximum probable discharge was estimated to be 1350 cfs/sq. mi

$$\therefore \text{PMF} = (27.2 \text{ sq. mi})(1350 \text{ cfs/sq. mi})$$

$$\approx 36{,}700 \text{ cfs}$$

$$1/2 \text{ PMF} \approx 18{,}400 \text{ cfs}$$

3. STEP 2: Determine surcharge height to pass Q_{P1}, $STOR_1$, and Q_{P2}

 a. from Figure 1 determine surcharge height to pass Q_{P1} = 18,400 cfs

surcharge elevation	≈	469.3 ft
elev. spillway stoplogs	=	457.3 ft
surcharge height	=	12.0 feet

 b. determine volume of surcharge $STOR_1$ in inches of runoff

 First determine volume of storage in acre-ft [illegible]

 (1) determine surface area [illegible] surcharge elevation from Figure 2 ≈ 425 acres

 (2) determine average surface area [illegible] surcharge elevation and [illegible]

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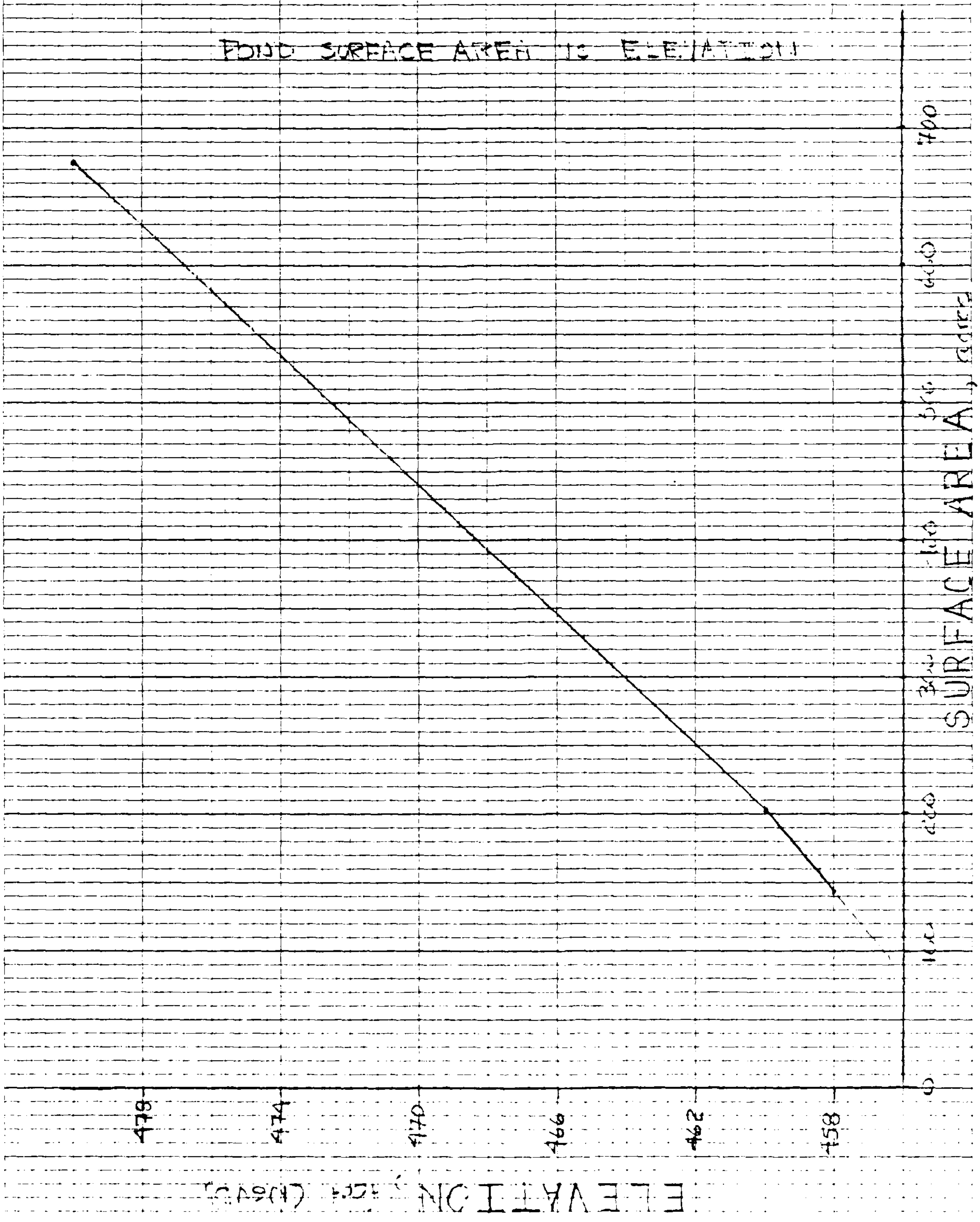
FIGURE 2

POND SURFACE AREA vs ELEVATION



3. multiply each average area by decimal portion of surcharge height

$$STOR_1 = \frac{\text{Volume of storage (as acre-inches)}}{\text{drainage area}}$$

$$STOR_1 = \frac{\left[(2.74)\left(\frac{122 \text{ acres} + 202 \text{ acres}}{2}\right) + (9.74)\left(\frac{202 \text{ ac} + 425 \text{ ac}}{2}\right)\right](2'')}{(27.2 \text{ sq mi})(640 \text{ acres/sq mi})}$$

$$STOR_1 = 2.31 \text{ inches}$$

c. determine Q_{P2}.

$$Q_{P2} = Q_{P1}\left(1 - \frac{STOR_1}{9.5''}\right)$$

$$Q_{P2} = (18,400 \text{ cfs})\left(1 - \frac{2.31}{9.5''}\right)$$

$$Q_{P2} \approx 13,900 \text{ cfs}$$

4. STEP 3: Determine surcharge height and $STOR_2$ to pass Q_{P2} and then Q_{P3}

a. From Figure 1 determine surcharge height to pass $Q_{P2} = 13,900$ cfs

Surcharge elevation $\approx$ 463.5 --
210' Spillway crest = 457.3 --
Surcharge height = 1.5 --

Surface area @ surcharge height $\approx$ [illegible]

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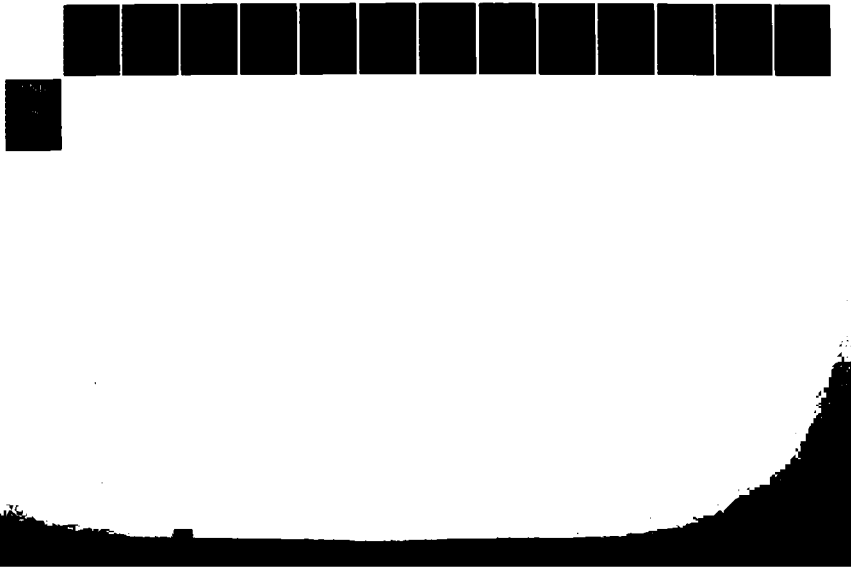

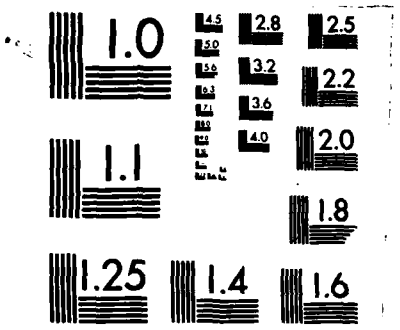

MICROCOPY RESOLUTION TEST CHART
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b. determine $STOR_2$

$$STOR_2 = \frac{\left[437ac + (8.9ft)\left(\frac{202ac + 410ac}{2}\right)\right](12"/ft)}{(27.2\ sq.mi)(640\ ac/sq.mi)}$$

$$= 2.16 \text{ inches}$$

c. Average $STOR_1$ and $STOR_2$

$$STOR_{AVG} = \frac{STOR_1 + STOR_2}{2}$$

$$STOR_{AVG} = \frac{2.31\ in + 2.16\ in}{2}$$

$$STOR_{AVG} = 2.23\ in$$

d. determine Q_{P3}

$$Q_{P3} = (18,400\ cfs)\left(1 - \frac{2.23"}{9.5"}\right)$$

$$Q_{P3} = 14,100\ cfs$$

5. STEP 4: Determine surcharge height for Q_{P3} and $STOR_3$

a. from Figure 1 surcharge height for $Q_{P3} = 14,100 cfs$

surcharge elevation ≈ 469.9 ft
elev. spillway stop logs = 457.3 ft
surcharge height = 11.5 ft

Surface area at surcharge elev ≈ 410 acres

b. determine $STOR_3$

$$STOR_3 = \frac{\left[437ac + (8.9ft)\left(\frac{202ac + 410ac}{2}\right)\right](12"/ft)}{(27.2\ sq.mi)(640\ ac/sq.mi)}$$

$STOR_3$ = 2.16 inches

c. determine $STOR_{AVG}$

$$STOR_{AVG} = \frac{2.23\,in + 2.16\,in}{2}$$

$STOR_{AVG}$ = 2.20 inches

d. determine Q_{p4}

$$Q_{p4} = (18{,}400\,cfs)\left(1 - \frac{2.20"}{9.5}\right)$$

Q_{p4} = 14,100 cfs

6. STEP 5: Determine surcharge height for Q_{p4} and $STOR_4$

a. From Figure 1 surcharge height for Q_{p4} = 14,100 cfs

surcharge elevation ≈ 469.3 ft
elev. spillway stop logs = 457.3 ft
11.5 feet

surface area @ surcharge elev ≈ 410 acres

b. determine $STOR_4$

$$STOR_4 = \frac{\left[437\,ac + (8.8ft)\left(\frac{202ac + 410ac}{2}\right)\right](12"/ft)}{(27.2\,sq.mi)(640ac/sq.mi)}$$

$STOR_4$ = 2.18 inches

c. determine $STOR_{AVG}$

$$STOR_{AVG} = \frac{2.21\,in + 2.18\,in}{2}$$

= 2.19 inches

$STOR_4$ and $STOR_{AVG}$ agree to within 1%, therefore accept routed test flood outflow equal to 14,100 cfs at a surcharge elevation of 468.9 feet

7 In Conclusion

a. The routed test flood outflow of 14,100 cfs will overtop the dam by approximately 4.3 feet

b Spillway capacity - with stoplogs set at design crest elevation of 457.3 feet

(1) Water surface at crest of dam - 464.5 feet
(use orifice discharge equation per previous discussion)

$$Q = (0.6)(176\ ft^2)\left[(2)(32.2)(464.5' - 460.1')\right]^{1/2} \approx 1,780\ cfs$$

(2) water surface at test flood elevation - 468.9 feet

(a) discharge through stoplog bay

$$Q = (0.6)(176\ ft^2)\left[(2)(32.2)(468.9 - 460.1')\right]^{1/2} \approx 2500\ cfs$$

(b) discharge over service bridge

$$Q = (2.8)(37ft)(468.9' - 464.5')^{3/2} \approx 920\ cfs$$

(c) $Q_{TOTAL} = 2,500\ cfs + 920\ cfs = 3,420\ cfs$

III. Using "Rule of Thumb" Guidance for Estimating Downstream Failure Hydrographs examine impact of dam failure

A. Since spillway length is large compared to length of dam, the tailwater resulting from discharge over the spillway with the water surface at the crest of dam may be significant

1. from previous calcs. steady state discharge over spillway with water surface at crest of dam ≈ 1,780 cfs (p.D-14 of the Hydrologic Calcs).

2 Using Stage - Discharge curve prepared for routing of failure discharge determine stage for steady state discharge

a. Reach 1 - from Figure 3 Stage ≈ 8.0 feet

b Reach 2 - from Figure 3 Stage ≈ 6.2 feet

3. The failure discharge should now be computed and routed through the stream reaches using the "Rule of Thumb" Guidance for Estimating Downstream Failure Hydrographs. If the hazard is significantly increased by the failure discharge then the hazard classification will be defined by this routing procedure. If there is no significant increase in hazard over the steady state discharge, then the hazard classification should be determined by routing the [illegible] through the [illegible] crest.

B. Reach 1

1. STEP 1: Determine reservoir storage at time of failure

from previous calcs storage ≈ 1,990 ac-ft

2. STEP 2: Determine Peak Failure Outflow, Q_{P1}:

a. $Q_{P1} = (8/27)\, W_b\, g^{1/2}\, Y_o^{3/2}$

where W_b = Breach Width (max 40% of dam length)
= (0.4)(45 feet)
= 18 feet
width of each section of spillway equals 17.4 feet, thus assume failure of 3 spillway bays

Y_o = Total height from channel bottom to pool level at failure
= 464.5' − 452.5' (crest elevation)
= 12 feet

$Q_{P1} = (8/27)\,(17.4 \text{ feet})\,(32.2)^{1/2}\,(12 \text{ feet})^{3/2}$

≈ 1,220 cfs

b. must add discharge for unfailed sections of spillway to the failure discharge

$Q_{\text{unfailed sections}} = 1/2$ (spillway discharge at design head)
$= 1/2\,(1790 \text{ cfs})$
$= 890$ cfs

c $Q_{P1(\text{total})} = 1,220 \text{ cfs} + 890 \text{ cfs}$
$= 2,110$ cfs

STEP 3: Prepare stage-discharge curve for Reach 1

a. Pertinent Data

(1) Reach length = 100 feet
(2) Channel slope = 0.0016
(3) Manning n = 0.06
(4) Channel shape - trapezoidal
(5) Base width ≈ 45 feet

b. See Figure 3 for stage-discharge curve

STEP 4: Estimate Reach Outflow

a. Determine stage for Q_{P_1} = 2,110 cfs from Figure 3 and find volume in reach

(1) Stage (depth of flow) above prefailure discharge = 0.3 feet (Total Stage = 3.3 feet)

(2) Volume in reach = (reach length) (cross-sectional area of channel)

$$\text{X-area} = (0.5)(0.3\text{ ft})(67\text{ ft} + 68\text{ ft})$$
$$= 54\text{ ft}^2$$

$$\text{Volume} = V_1 = \frac{(54\text{ ft}^2)(100\text{ ft})}{43{,}560\text{ ft}^2/\text{acre}}$$

$$= 0.12\text{ acre-ft}$$

$V_1 < \frac{S}{2}$ ∴ reach length OK

b. Determine $Q_{Pz(TRIAL)}$

$$Q_{Pz(TRIAL)} = Q_{P1}\left(1 - \frac{V_1}{S}\right)$$

$$Q_{Pz(TRIAL)} = (2{,}110\text{ cfs})\left(1 - \frac{0.12\text{ acre-ft}}{1{,}350\text{ acre-ft}}\right)$$

$$Q_{Pz(TRIAL)} = 2{,}110\text{ cfs}$$

c. Compute V_2 using $Q_{P2(TRIAL)}$

From Figure 3 determine stage for $Q_{P2(TRIAL)}$

Stage = 0.8 feet above prefailure discharge (Total Stage = 3.8 feet)

X-area = (0.5)(0.8 feet)(67 ft − 63 ft.)
= 54 ft^2

$$V_2 = \frac{(54\ ft^2)(100\ ft)}{43{,}560\ ft^2/acre}$$

V_2 = 0.12 acre-ft

d. Average V_1 and V_2 and compute Q_{P2}

(1) $$V_{avg} = \frac{V_1 + V_2}{2}$$

$$V_{avg} = \frac{0.12\ ac\text{-}ft + 0.12\ ac\text{-}ft}{2}$$

V_{avg} = 0.12 ac-ft

(2) $$Q_{P2} = Q_{P1}\left(1 - \frac{V_{avg}}{S}\right)$$

$$Q_{P2} = (2{,}110\ cfs)\left(1 - \frac{0.12}{1{,}980}\right)$$

Q_{P2} = 2,110 cfs

C. Reach 2

STEP 3: Prepare stage-discharge curve for Reach 2

a. Pertinent Data

(1) Reach length = 500 feet
(2) Channel slope = 0.0016
(3) Manning n = 0.06
(4) Channel shape - trapezoidal
(5) Base width ≈ 45 feet

b. See Figure 3 for stage-discharge curve

STEP 4: Estimate Reach Outflow

a. Determine stage for Q_{P2} = 2,110 cfs from Figure 3 and find volume in reach

(1) Stage (depth of flow) = 0.3 ft above prefailure discharge (Total Stage = 6.5 ft.)

(2) Volume in reach = (reach length) (cross-sectional area of channel)

$$\text{X-area} = (0.5)(0.3 \text{ ft})(630 \text{ ft} + 695 \text{ ft}) \approx 197 \text{ ft}^2$$

$$\text{Volume} = V_1 = \frac{(197 \text{ ft}^2)(500 \text{ ft})}{43{,}560 \text{ ft}^3/\text{acre}}$$

$$= 2.3 \text{ acre-feet}$$

$$V_1 < \frac{S}{2} \quad \therefore \text{ reach length OK}$$

b. Determine $Q_{P3(TRIAL)}$

$$Q_{P3(TRIAL)} = Q_{P2}\left(1 - \frac{V_1}{S}\right)$$

$$Q_{P3(TRIAL)} = (2{,}110 \text{ cfs})\left(1 - \frac{2.3}{\quad}\right)$$

$$Q_{P3(TRIAL)} = 2{,}110 \text{ cfs}$$

c. Compute V_2 using $Q_{P3(TRIAL)}$

From Figure 3 determine stage for $Q_{P3(TRIAL)}$

Stage = 0.3 ft above prefailure discharge (Total stage = 6.5 ft)

X-area = (0.5)(0.3 ft)(630 ft + 695 ft)
≈ 197 ft²

$$V_2 = \frac{(197\ ft^2)(500\ ft)}{43{,}560\ ft^2/acre}$$

V_2 = 2.3 acre-ft

d. Average V_1 and V_2 and compute Q_{P3}

(1) $$V_{avg} = \frac{V_1 + V_2}{2}$$

$$V_{avg} = \frac{2.3\ ac\text{-}ft + 2.3\ ac\text{-}ft}{2}$$

V_{avg} = 2.3 acre-ft

(2) $$Q_{P3} = Q_{P2}\left(1 - \frac{V_{avg}}{S}\right)$$

$$Q_{P3} = (2{,}110\ cfs)\left(1 - \frac{2.3}{1880}\right)$$

Q_{P3} = 2,110 cfs

5. Conclusions from failure discharge routing

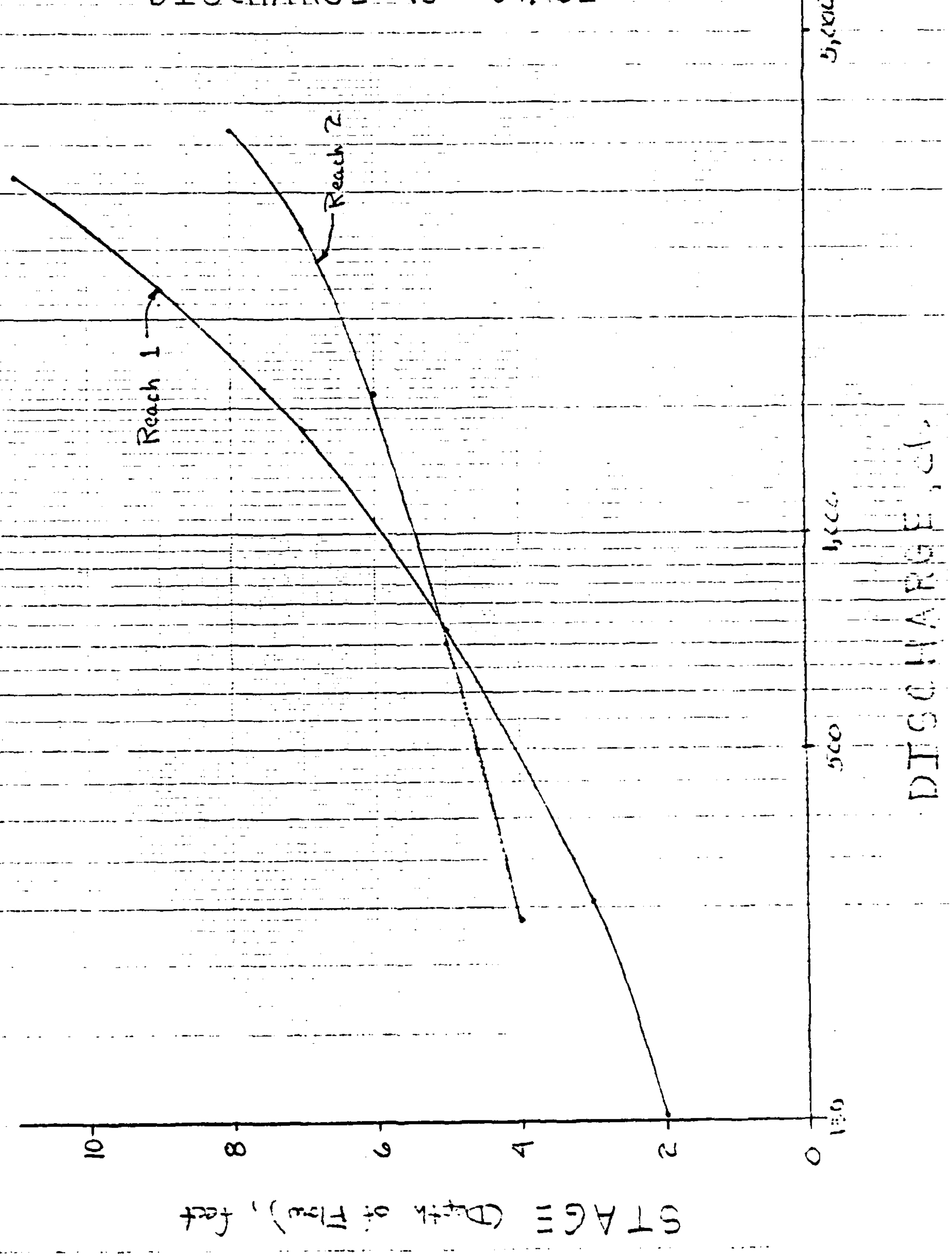
1. Reach 1 - The addition of the failure discharge will increase the stage in this reach by about 1 foot above that for the pre-failure flow. This increase in stage will result in water rising to the sill level of the building located near the right abutment. The prefailure discharge was about 1 foot below the sill.

2. Reach 2 - Downstream from Reach 1 the stream channel profile broadens significantly. Consequently, there is very little difference between the stage of the failure discharge and the prefailure flow, since a relatively small increase in stage results in a significant increase in discharge. No significant damage would result in Reach 2.

3. Although the increase in stage in Reach 1 is not large, it does result in water reaching the sill level of the building located near the right abutment. Consequently, the hazard would increase substantially due to the potential for economic loss. Therefore, the hazard classification for the Pennwalt Company Dam was changed from that in the previous analysis.

FIGURE 3

DISCHARGE vs STAGE



APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

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